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US Army Corps
of Engineers
Los Angeles District

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Water Resources Development in Nevada 1987

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**1987
Water Resources
Development**

NEVADA

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Letter from the Acting Assistant Secretary of the Army for Civil Works

Enactment of the Water Resource Development Act of 1986 provides our Nation with a framework for water resources development until well into the 21st century. The law has made numerous changes in the way potential new projects are studied, evaluated and funded. The major change is that non-Federal cost sharing is specified for most Corps water resources projects. A new partnership now exists between the Federal government and non-Federal interests that affords the latter a key role in project planning and allows the Federal government to spread its resources over more water projects than would have been possible before.

With the passage of this law, the Federal water resources program is in better shape than at any time in the past 16 years. The law authorizes over 260 new projects for inland navigation, harbor improvement, flood control, and shore protection—with additional benefits in water supply, hydropower and recreation.

I hope this booklet gives you a glimpse of the extent, variety and importance of the U.S. Army Corps of Engineers water resources development activities in your State.

JOHN S. DOYLE, JR.
Acting Assistant Secretary of the Army
(Civil Works)



Foreword by Chief of Engineers

Our Nation's water resources program, as well as our Constitution, may well have been born on the banks of the Potomac River in the 1780s out of a disagreement between Virginia and Maryland.

Both states claimed jurisdiction over navigation on the Potomac and Pokemoke Rivers and the Chesapeake Bay. Under the Articles of Confederation, the Continental Congress did not have the power to resolve the dispute and regulate commerce. Fortunately, the states decided to meet to settle the matter. A convention was held at Mount Vernon in 1785; and again in Annapolis in 1786.

Out of those two meetings grew the belief that a strong central government was needed. At the very least, the Articles of Confederation needed to be amended. The convention attendees petitioned Congress in February 1787 and the Constitutional Convention was held in Philadelphia that May.

Thus, in celebrating the bicentennial of the United States Constitution this year, we are, in a way, celebrating the birth of our water resources program. The program encompasses port and river navigation improvements, flood damage reduction, beach erosion control, hydropower generation, water storage, development regulation in navigable waters and wetlands, and recreation. In all, the Corps manages almost 2,000 water resource projects across the Nation. It does this in cooperation with local interests and other Federal agencies.

This year, the Corps has the additional challenges of the projects authorized by Public Law 99-662, the Water Resources Development Act of 1986. This act lays the foundation for water resource development for generations to come.

This booklet is one of a series detailing water resources programs in the 50 states and U.S. possessions. I hope you find it interesting and useful.

E.R. Heiberg
E.R. HEIBERG III
Lieutenant General, USA
Chief of Engineers



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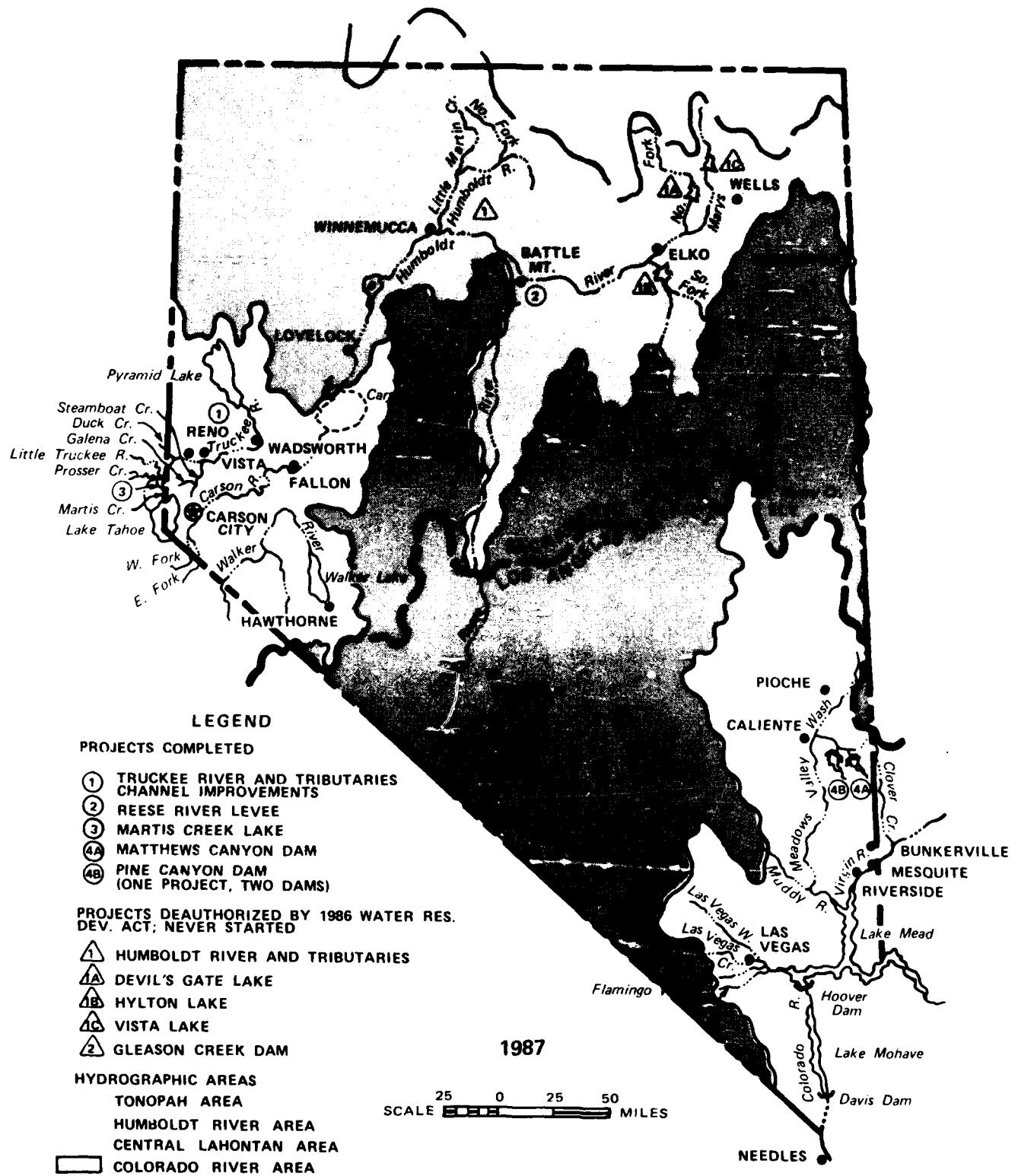
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Foreword

This booklet outlines current information on the scope and status of water resource projects and studies by the Corps of Engineers within the State of Nevada. It also describes briefly the role of the Corps of Engineers in planning and constructing water and related land improvements, and explains the procedure for initiating studies leading to authorization of such projects. Information is given on the status of various projects, whether the construction has been completed, is underway, or not started, together with data on the purposes and schedules of studies. In addition, it contains information on emergency authorities and regulatory functions.

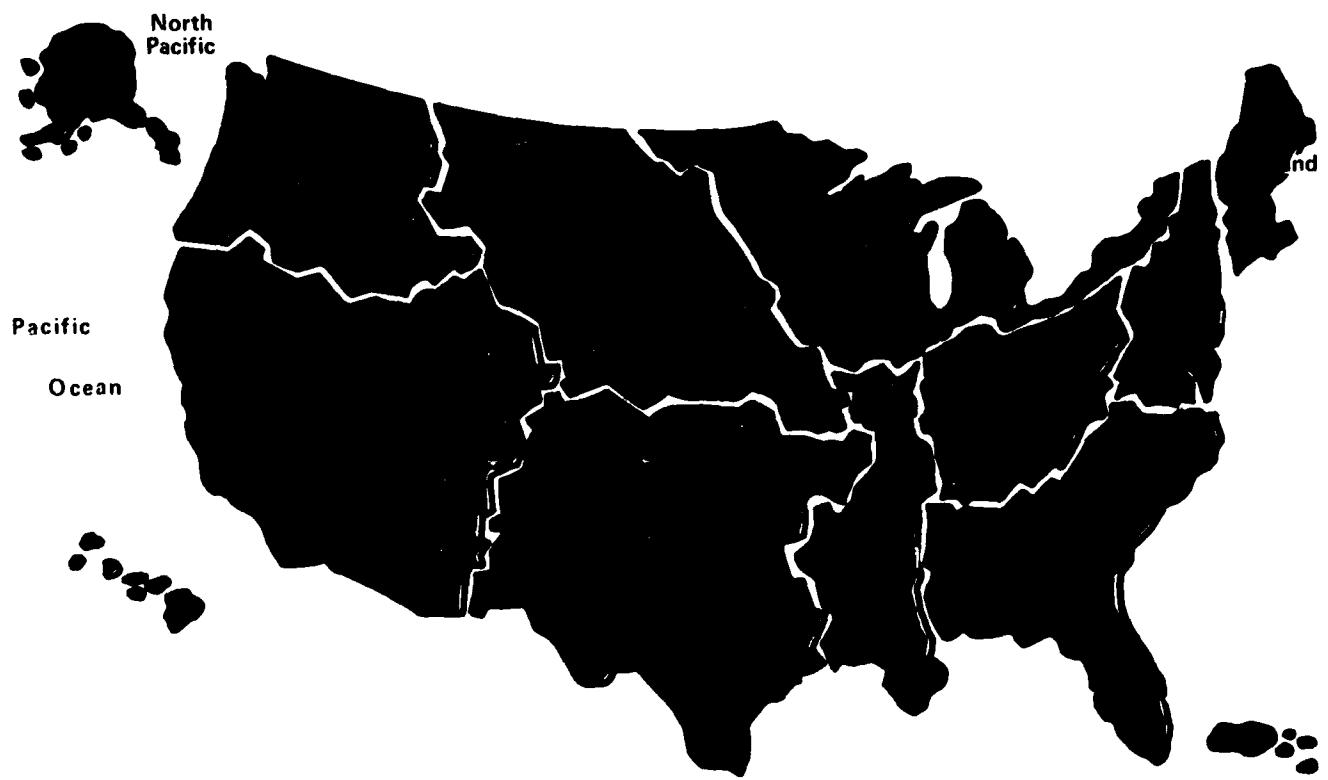
The Corps of Engineers' civil works activities are organized by drainage basins and the work of Nevada comes within the jurisdiction of two Districts — Sacramento and Los Angeles. Further information on the responsibilities of the U.S. Army Corps of Engineers activities, projects, and programs is available from the offices listed on the title page.



Introduction



Civil Works Divisions



Introduction

From 1775 to the present, the U.S. Army Corps of Engineers has served the nation in peace and war.

Formed by General George Washington during the Revolutionary War as the engineering and construction arm of the Continental Army, the Corps built fortifications and coastal batteries to strengthen the country's defenses and went on to found the Military Academy at West Point, to help open the West, and to develop the Nation's water resources. Today it is the largest engineering organization in world.

Although the primary mission of the Corps has always been to provide combat support to our fighting Army, the Nation over the years also needed roads, railroad, lighthouses, bridges, and other works of engineering. Consequently, since the period immediately following the Revolutionary War, the Corps has carried out numerous civil works responsibilities, and since 1824, it has been the principal developer of the Nation's water resources.

Ever responsive to the changing needs and demands of the American people, the Corps has planned and executed national programs for navigation, flood control, water supply, hydroelectric power, recreation, conservation, and preservation of the environment. In its military role, the Corps plans, designs and supervises the construction of modern facilities which are necessary to ensure the combat readiness of our Army and Air Force.

AUTHORIZATION AND PLANNING PROCESS FOR WATER RESOURCES PROJECTS

Water resources activities are initiated by local interests, approved by the Administration, authorized by Congress, funded by Federal and non-Federal sources, and constructed by the Corps under the Civil Works Program.

The Water Resources Development Act of 1986 made numerous changes in the way potential new water resources projects are studied, evaluated and funded. The major change is that the law now specifies non-Federal cost sharing for most of the Corps' water resources projects and studies.

When local interests feel that a need exists for improved navigation, flood protection, or other water resources development, they may petition their representatives in Congress. (Technical assistance and some small projects can be accomplished without Congressional authorization under the Continuing Authorities Program.) Once Congress is petitioned, a Congressional committee resolution or an Act of Congress may then authorize the Corps of Engineers to investigate the problem and submit a report. The report contains the necessary engineering, economic, and environmental investigations which include consideration of the full range of alternative solutions to the problem.

Public meetings are held to determine the views of local interests on the extent and type of improvements desired, as well as the need for the improvement. The desires of local interests and the views of Federal, State, and other agencies receive full consideration during the planning process.

Considerations which enter into recommendations for project authorization to Congress include determinations that benefits will exceed costs, and that the engineering design of the

project is sound, best serves the needs of the people concerned, makes the wisest possible use of the natural resources involved, and adequately protects the environment.

A report, along with a final environmental statement, is then submitted to higher authority for review and recommendations. After review and coordination with all interested Federal agencies and governors of affected States, the Chief of Engineers forwards the report, with the environmental statement, to the Secretary of the Army, who obtains the views of the Office of Management and Budget before transmitting the report and environmental statement to Congress, with his recommendations.

Budget recommendations are based on evidence of support by the State and by the ability and willingness of non-Federal sponsors to provide their share of the project cost.

If Congress includes the project in an authorization bill, enactment of the bill constitutes authorization of the project. Once a project is authorized, further studies may be required to reaffirm the basic plan presented to Congress.

Appropriation of money to build a particular project is usually included in the annual Energy and Water Development Appropriation bill which must be approved by both Houses of the Congress and the President.

NAVIGATION

Federal interest in navigation improvements stems from the Commerce Clause of the Constitution, and from subsequent decisions of the Supreme Court to the effect that the Federal obligation to regulate navigation and commerce also includes the right to make necessary improvements. The Corps of Engineers was first assigned responsibility for improving rivers and harbors in 1824. Today, the Corps is responsible for construction, as well as the maintenance and operation, of Federal river and harbor projects.

The system of harbors and inland waterways remains one of the most important parts of the Nation's transportation system. Without constant supervision, rivers and other waterways collect soil, debris and other obstacles which lead to groundings and wrecks. New channels and cutoffs appear frequently; they and the main traffic lanes require diligent patrolling. Where authorized to do so, the Corps maintains the Nation's waterways in navigable condition for both business and recreational purposes, benefiting the economy and helping prevent loss of lives.

FLOOD CONTROL AND FLOOD PLAIN MANAGEMENT

Federal interest in flood control began in the alluvial valley of the Mississippi River in the 19th century when the interrelationship of flood control and navigation became apparent. Corps authority for flood control work was extended in 1936 to embrace the entire country. After a series of disastrous floods affecting wide areas, including transportation systems, it was recognized that the Federal Government should participate in the solution of problems affecting the public interest when they are too large or complex to be handled by State or local organizations.

The purpose of flood control works is to regulate floodflows and thus prevent flood damage. In addition, the Flood Control Act of 1944 provided that "flood control" shall include major drainage of land. These objectives are accomplished with reservoirs, local protection works, or combinations of the two.

Reservoirs constructed for flood control storage often include additional storage capacity for multiple-purpose uses, such as the storage of water for municipal and industrial use, navigation, irrigation, development of hydroelectric power, consideration of fish and wildlife, and recreation.

Local flood protection works are turned over to non-Federal authorities for maintenance, as are small reservoirs with a local impact.

The Corps fights the Nation's flood problems by not only constructing and maintaining flood control structures, but also by providing detailed technical information on flood hazards. Under the Flood Plain Management Services Program, the Corps provides (on request) flood hazard information, technical assistance and planning guidance to other Federal agencies, States, local governments and private individuals. This data and assistance are designed to aid planning for floods and providing for the regulation of flood plain areas, thus avoiding unwise development in flood-prone areas.

As an example, if community officials know what areas flood in their community and how often this could occur, they then can take necessary action to prevent or minimize damages to existing and to new buildings and facilities by adopting and enforcing zoning ordinances, building codes, and subdivision regulations. The data on flooding and assistance in preparing the various regulations are the types of help available through the Flood Plain Management Services Program.

The Flood Plain Management Services Program also provides assistance to other Federal agencies and to State agencies in the same manner. Flood hazards data are developed and provided on request to the extent and detail needed so that those agencies can properly consider the flood hazards in the execution of their programs.

SHORE AND HURRICANE PROTECTION

The Corps' work in shore protection began in 1930, when Congress directed it to study ways to reduce erosion along U.S. seacoasts and the Great Lakes. While each situation the Corps studies requires different considerations, the Corps looks at each one with structural and nonstructural solutions in mind. Engineering feasibility and economic efficiency are considered along with environmental and social impacts.

Recommendation for Federal participation is based on shore ownership, use and type and incidence of benefits. If there is no public use or benefit, Federal participation is not recommended. Maintenance of the restored shore is a non-Federal responsibility.

The Corps' work in hurricane protection began with a 1955 law when Congress directed it to conduct general investigations along the Atlantic and Gulf Coasts to identify problem areas and determine the feasibility of protection. These eastern and southern seabards have been the sites of catastrophic loss of life and property due to hurricanes.

In some cases, abnormal storm-induced tidal flooding can be prevented or reduced by protective structures, including dams and barriers in estuaries, with openings for navigation. Other measures include raising dunes and constructing dikes, walls, and breakwaters. There are also places where increasing the height of natural beaches affords effective protection.

HYDROPOWER

The Corps has played a significant role in meeting the Nation's electric power generation needs by building and operating hydropower plants in connection with its large multiple-purpose dams. In a series of laws and resolutions dating back to the Rivers and Harbors Act of

1909, Congress has directed the Corps of Engineers to give consideration in its reports to various water uses, including hydroelectric power.

The Corps continues to consider the potential for hydroelectric power development during the planning process for all water resources projects involving dams and reservoirs. In most instances, however, hydropower facilities at Corps projects are now developed by non-Federal interests without Federal assistance. The Corps becomes involved with planning, constructing and operating hydropower projects only when it is impractical for non-Federal interests to do so. The Water Resources Development Act of 1986 requires non-Federal interests to bear 100 percent of the project costs allocated to hydropower in accordance with the marketing provisions of the Department of Energy Organization Act.

WATER SUPPLY

The Water Supply Act of 1958, as amended by the Water Resources Development Act of 1986, authorized the Corps to provide additional storage in its reservoirs for municipal and industrial water supply at the request of local interests, provided those interests agree to pay 100 percent of the cost. In granting this authority, however, Congress stipulated that no more than 30 percent of the construction costs of a project may be for water storage.

The Flood Control Act of 1944 provided that the Corps reservoirs may, without cost to the local community, be used for irrigation upon recommendation of the Secretary of the Interior and in conformance with the Reclamation Act of 1902, which applies in 17 Western States. The Water Resources Development Act of 1986 modified cost sharing for irrigation, water supply for future projects. It requires non-Federal to pay 35 percent of the allocated costs for irrigation.

Reservoir capacity can also be used for water quality control and streamflow regulation, as authorized by the Federal Water Pollution Control Act Amendments of 1961.

ENVIRONMENTAL QUALITY

In conducting its Civil Works Program, the Corps must comply with many environmental laws or executive orders and numerous regulations relating to the environment. Consideration of the environmental impact of a Corps project begins in the early planning stages, and continues through design, construction and operation of the project. The Corps must also comply with many of these environmental regulations in conducting its regulatory programs (see next section). The National Environmental Policy Act (NEPA) of 1969 is the national charter for the protection of the environment, and its procedures ensure that public officials and private citizens may obtain and provide environmental information before Federal agencies make decisions concerning the environment. Corps of Engineers project planning procedures under NEPA often point out the need for more extensive environmental studies; namely, the preparation of environmental impact statements. In selecting alternative project designs, the Corps strives to choose options with minimum environmental impact.

REGULATORY PROGRAMS

Within its regulatory program, the Corps of Engineers has a mandate to protect navigation by regulating construction by others in navigable waterways under Section 10 of the Rivers and Harbors Act of 1899. Section 404 of the Clean Water Act, which further refined the 1972 Federal Water Pollution Control Act, and related court decisions greatly broadened the Corps' regulatory authority to include the discharge of dredged or fill material into "waters of the United States," a term which includes certain wetlands and other valuable aquatic areas. Section 404 of

the Clean Water Act requires notification of the public and opportunity for public hearings before the issuance of a permit.

The Corps' regulatory program now focuses primarily on weighing the economic and environmental benefits of development versus ecosystem preservation in deciding whether a permit for a proposed activity would be "contrary to the public interest." When reviewing permit applications, the Corps looks at all the relevant factors including conservation, economics, esthetics, general environmental concerns, historic values, wetland values, fish and wildlife values, flood damage prevention, land use classification, navigation, recreation, water supply, water quality, energy needs, food production and the general welfare of the public.

In response to the President's Task Force on Regulatory Relief to reduce the border of paperwork involved in processing individual Department of the Army permits, the Corps of Engineers has introduced a number of nationwide permits which require little or no processing; and taken other measures to streamline the permit application process while maintaining environmental safeguards. The separate Corps of Engineers' districts have also issued general permits for certain types of minor works in specific areas which require only minimal processing.

RECREATION

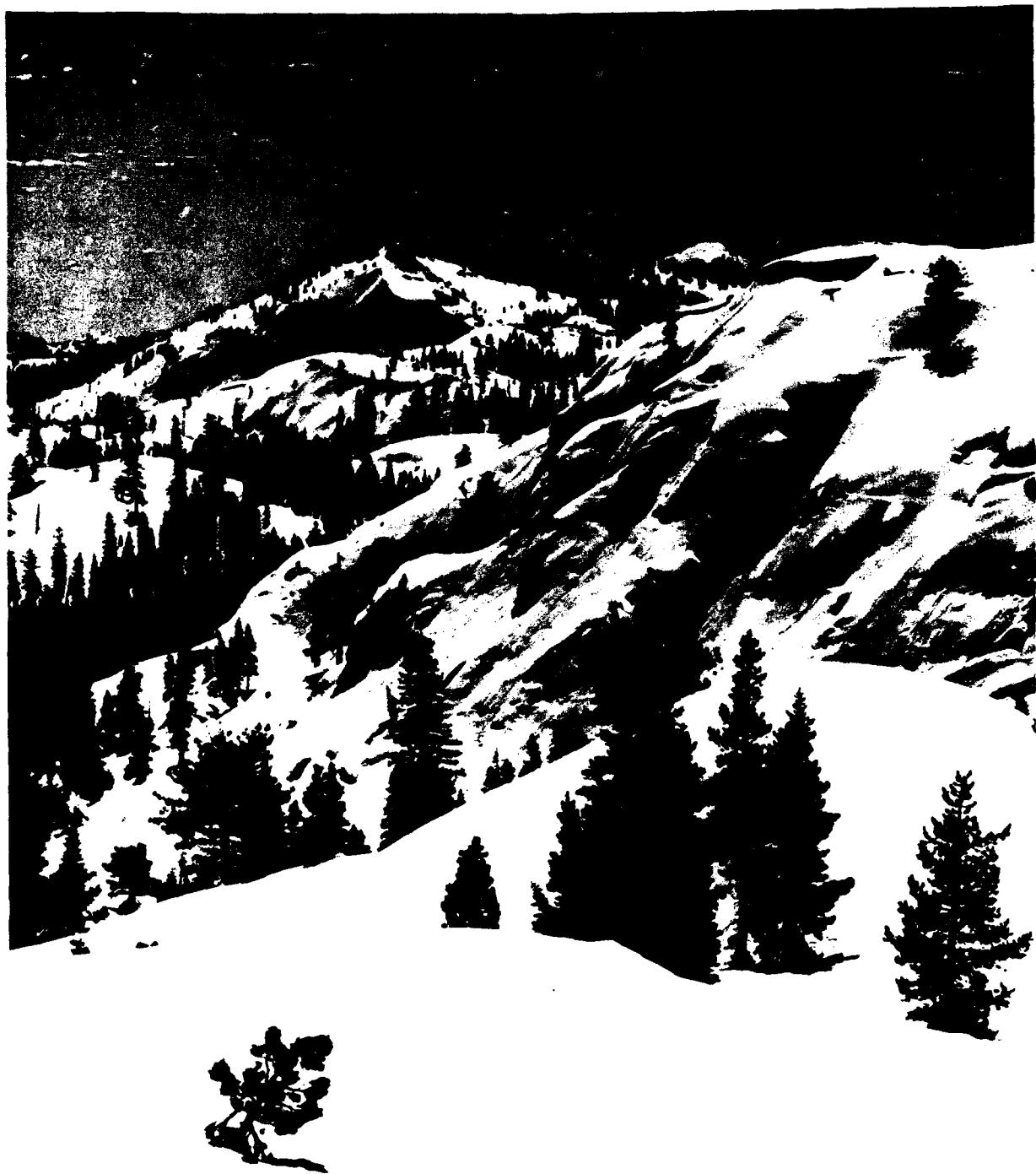
The Flood Control Act of 1944, as amended, provides authority to construct, maintain, and operate public park and recreational facilities at water resources development projects under the control of the Secretary of the Army, and to permit the construction, maintenance, and operation of such facilities. It also provides that the water areas of projects shall be open to public use—generally for boating, fishing, and other recreational purposes.

EMERGENCY RESPONSE AND RECOVERY

Corps' assistance for emergency/disaster response and recovery is available under Corps' authorities, such as PL 84-99, Flood Control and Coastal Emergencies, or in support of other agencies, particularly the Federal Emergency Management Agency (FEMA) under PL 93-288 and EO 12148. Corps' response activities under the PL 84-99 authority include the following: emergency operations, e.g., flood fight, rescue and emergency relief activities; emergency repair and restoration of flood control works which are threatened, damaged, or destroyed by flood; emergency protection of existing Federal hurricane or shore protection works; the repair or restoration of Federal hurricane or shore protective structures damaged or destroyed by wind, wave or water action of other than ordinary nature; preventive work performed prior to flooding when conditions pose a flood threat to life or property; providing emergency supplies of clean water to any locality confronted with a source of contaminated water causing or likely to cause a substantial threat to public health and welfare; and provision of water supplies to drought-distressed areas by well drilling on a reimbursable basis or transportation of water at Federal cost.

In support of FEMA's disaster response and recovery activities, Corps' mission assignments have included: emergency debris removal, preliminary damage assessments, detailed damage survey reports, temporary housing, emergency snow removal, contracting and construction management, and other support which calls upon the Corps' engineering, contracting and construction expertise.

Chapter 1



The U.S. Army Corps of Engineers and Its Activities in Nevada

The Corps of Engineers has been involved in developing Nevada's water resources since 1884, when Congress authorized navigation improvements along the Colorado River. During the next 2 years, Army Engineers widened and deepened the Colorado River channel by blasting and removing tons of rock that blocked the river and menaced navigation. Small dams were placed in secondary channels to raise water levels in the main channel.

In the more than 100 years since this beginning, the Corps of Engineers' work in Nevada has experienced significant growth, and encompassed many of the Corps of Engineers' missions and responsibilities described in the Introduction. All of these activities are carried out in accordance with directives of the Congress, and are supervised by the U.S. Army Chief of Engineers under the direction of the Secretary of the Army. Army Engineers perform their civil works responsibilities in close cooperation with other Federal agencies and with State, regional, and local authorities, and with the involvement and participation of affected communities, organization, and individuals.

The State of Nevada has been divided in the booklet into four distinct areas for the purpose of describing the Corps of Engineers' activities — the Humboldt River Area, the Central Lahontan Area, the Tonopah Area, and the Colorado River Area. The first three are natural hydrologic subregions of the Great Basin Region, which has no drainage outlet to the sea. The Great Basin covers some 88,000 square miles, about 80 percent of the total area in Nevada. The fourth area, the Colorado River Area in Nevada, covers about 17,000 square miles in the southeastern corner of the State, and is a subregion of the Lower Colorado Region. There are no water resources development activities in the Snake River and Great Salt Lake drainage in the northeastern Nevada, and this 10,000-square-mile area is not covered in this booklet.

These four areas provide a logical basis for consideration of the water resources development activities of the Corps of Engineers in Nevada. These activities are described in detail in the next four chapters, each one of which covers one of the four areas. The activities covered include flood control planning studies and projects, flood plain management services, emergency work, and cooperation with other agencies. This chapter describes in general terms the activities of the Corps of Engineers in Nevada, and the map on page viii of the booklet shows the status of projects in Nevada.

The flood control programs of the Corps of Engineers in Nevada will provide for the most urgent needs of urban, suburban, and agricultural areas. Of the six flood control and multiple-purpose stage projects now authorized for Nevada, it is estimated that the four completed flood control projects in Nevada have prevented more than \$2,815,000 in total accumulated flood damages. These completed projects include three Sacramento District projects and one Los

Angeles District project. Sacramento District projects include Reese River, Martis Creek Lake, and Truckee River and Tributaries. The Los Angeles District project is the Mathews Canyon and Pine Canyon Dams. Each District also has one ongoing flood control investigation. Sacramento District is conducting the Truckee Meadows (Reno Sparks Metropolitan area) investigation; and Los Angeles District, the Las Vegas and Tributaries investigation.

Of the 710 flood plain information responses handled by the flood plain management services, Sacramento District completed 380, and Los Angeles District, 330. Of five flood plain information reports completed, Sacramento District completed three — a report for the Truckee River in the Reno, Sparks, and Truckee Meadows areas, a report for Steamboat Creek and tributaries in Steamboat and Pleasant Valleys, and a report for the foothill streams southwest of Reno; and Los Angeles District completed two — one on Lower Las Vegas Wash and one on Muddy River in the vicinity of Overton.

The civil works program is directed toward the development of water resources in a way that will lead to the satisfaction of all water-related requirements — both immediate and long-range. These include navigation, flood control, major drainage, water supply for irrigation and municipal-industrial uses, regulation of hydraulic mining debris, hurricane flood protection, water quality control and wastewater disposal, hydroelectric power, shore protection and beach stabilization, water-oriented recreation, enhancement of fish and wildlife resources, and the preservation of esthetic and ecological values. Special emphasis is being placed on flood plain management in support of a national effort to reduce flood losses through appropriate local regulation of the use of flood prone areas.

The basic authority for Corps of Engineers participation in the development of water resources lies in the "commerce clause" of the Constitution, which gave Congress the power to "regulate commerce with foreign nations, and among the several states, and with the Indian tribes." Under this authority, during the 1820s Congress assigned the Corps of Engineers the responsibility for projects dealing with navigation on the Ohio and Mississippi Rivers. This basic authority, which pertained solely to navigation, was expanded by Congress in 1936 to include nationwide responsibility for flood control and, subsequently, the many related aspects of comprehensive water resources development.

More recently, in recognition of the profound impact of man's activity on the interrelations of all components of the natural environment, Congress approved the National Environmental Policy Act of 1969 (Public Law 91-190). The act established a policy that encourages productive and enjoyable harmony between man and his environment, promotes efforts to prevent damage to the environment, stimulates the health and welfare of man, and enriches the understanding of ecological systems and natural resources. Under Section 102 of that act, every recommendation for a Federal project must include a detailed statement on the:

- Environmental impact of the proposed action.
- Adverse environmental effects that cannot be avoided should the proposal be implemented.
- Alternatives to the proposed action.
- Relationship between local, short-term use of the environment and the maintenance and enhancement of long-term

productivity.

- Irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented.
- Coordination of the proposal with interested Federal, State, and local agencies.

Well aware of the complexities associated with water as natural resource essential to all living things, the Corps of Engineers has long recognized the need for including environmental analysis and planning as an integral factor in water resources studies and in project formulation. The Corps worked as a representative member of the Special Task Force of the President's Water Resources Council in developing the role of environmental considerations in solutions to water problems. At the District, the Corps has established environmental planning groups staffed with biologists, ecologists, archeologists, environmental protection specialists, geographers, environmental engineers, recreation specialists, and others — all contributing the expertise of their educational disciplines to environmental considerations.

In project planning, the basic objective in the formulation of plans is to provide for the best use, or combination of uses, of water and related land resources of a region to meet foreseeable short- and long-term needs. To achieve the basic objective, Corps planners give specific consideration to the four separate planning objectives set forth in Section 209 of the 1970 Flood Control Act (Public Law 91-611). These are to ensure the enhancement of:

- Regional economic development.
- Quality of the total environment and its protection and improvement.
- Well being of the people.
- National economic development.

In other words, Corps' planners in cooperation with local interests must arrive at rational well-considered decisions on what constitutes the best plan among alternative or competing plans for the use of water and related land resources by analyzing the environmental, social, and esthetic values that — together with economic considerations — loom large in developing plans of improvement that meet the desires and needs of the people.

The concept of comprehensive, multiple-purpose, and coordinated planning and development for entire river basins or groups of river basins has been accepted for a long time. Corps of Engineers' water resources development utilizes comprehensive plans of major river basins, large blocks of river basins, or regions. In general, the basic objective is to provide for the best uses of water and land resources to meet the foreseeable short- and long-term needs of a region. In achieving this objective, consideration is given to:

- Timely development and management of resources as essential aids to the economic development and growth of each region.
- Preservation of resources to ensure that they will be available for their best use, as needed.
- Conservation and enhancement of the environment and the well-being of all of the people.

Preparation of such plans is a team job. Many Federal, State, and local agencies are involved to ensure that plans have proper balance, meet all important needs, and are generally acceptable. Good water resources planning includes

— but is not limited to — consideration of domestic, industrial, and agricultural uses of water; navigation in relation to the national transportation system; hydroelectric power; flood control; water quality control; watershed protection and management; mineral- and forest-products production; grazing and cropland improvement; recreation; protection and enhancement of fish and wildlife resources; and preservation of unique areas of natural beauty, of historic or prehistoric value, or of scientific interest.

The 1970 River and Harbor Act (Public Law 91-611), as amended by Section 107 of the 1976 Water Resources Development Act (Public Law 94-587), further expanded the Corps' long-time considerations for good water resources planning. Under the act, the Corps is required to fully consider possible adverse economic, social, environmental, and ecological impacts in developing a project and to make certain that the final decisions on the project are made in the best overall interest — taking into consideration the need for flood control, navigation, and associated purposes, and the cost of eliminating or minimizing such adverse effects as well as the following:

- Air, noise, and water pollution.
- Destruction or disruption of man-made and natural resources, esthetic values, community cohesion, and the availability of public facilities and services.
- Adverse employment effects and tax and property-value losses.
- Injurious displacement of people, businesses, and farms.
- Disruption of desirable community and regional growth.

Another important consideration in water resources planning is the consideration of nonstructural alternatives to prevent or reduce flood damages. The 1974 Water Resources Development Act (Public Law 93-251) requires that in the survey, planning, or designing of any project involving flood protection, consideration shall be given to nonstructural alternatives to prevent or reduce flood damage — including the floodproofing of structures, flood plain regulation, acquisition of flood plain lands for recreational and fish and wildlife use and other public purposes, and relocation — all with a view toward formulating the most economically, socially, and environmentally acceptable means of reducing or preventing flood damages.

Coordination of project proposal is another essential element of water resources development planning. Coordination with all Federal, state, and local agencies concerned, and with interested local groups, is carried on during all stages of planning to:

- Obtain and exchange information on problems under study to ensure that all useful data available are considered and basic research is not duplicated.
- Ensure balanced development among the plans of other agencies and of local groups concerned by considering all pertinent facts on their plans and views.
- Develop feasible plans or programs that will make the best possible use of the natural resources involved.

Every Corps of Engineers' project must be specifically authorized by Congress except for certain work that may be authorized by the Public Works Committees or by the Chief of Engineers. As indicated, a large volume of legislation governs the activities of the Corps of Engineers in carrying out the civil works program. Information on selected authorities follows:

Flood Control Projects Including Multiple-Purpose Storage Projects

The purpose of flood control projects is to regulate flood flows and thus prevent flood damages. This is accomplished with flood control storage or levees and channel improvements, separately or in combination. In a flood control storage project, floodwaters are stored behind one or more dams and later released at nondamaging rates. The majority of storage projects are authorized for multiple purposes, i.e., the project would include flood control and one or more other purposes such as hydroelectric power, irrigation, navigation, municipal and industrial water supplies, water quality control, recreation, or enhancement of fish and wildlife resources. Some storage projects authorized primarily for flood control also may be used incidentally for other purposes such as recreation or fish and wildlife enhancement. In levee and channel improvement projects, sufficient channel capacity to carry peak flows is provided by dredging, clearing, and straightening the waterway; by constructing levees; by building a channel with smooth surfaces to improve flow characteristics; by providing bypasses; or by some combination of these methods. Recreational facilities — such as horseback-riding, bicycling, and hiking trails and picnic areas — may be included in levee and channel improvement projects.

In the 1880s, the Corps of Engineers was authorized to construct flood control levees along the lower Mississippi River; and in 1917, under the authority of Public Law 367, responsibility for flood control along the entire Mississippi River and for a limited amount of work on the Sacramento River was assigned. This was the first authorization of flood control improvements outside the Mississippi River Valley. Responsibility for the nationwide flood control program was assigned to the Corps of Engineers in Section 1 of the 1936 Flood Control Act, which established Federal policy on flood control as follows:

...it is the sense of Congress that flood control on navigable waters or their tributaries is a proper activity of the Federal Government in cooperation with States, their political subdivisions, and localities thereof...

Many specific projects have been authorized for construction, and completed projects have been extended or otherwise modified, under a series of Flood Control Acts since 1936, and basic procedures and policies have been shaped by these laws. Authorizing acts usually do not carry appropriations for undertaking the projects authorized. Funds for engineering, design, and construction, therefore, must be provided by subsequent appropriations acts.

Section 7 of the 1944 Flood Control Act (Public Law 78-534) provides that operating rules and regulations for flood control space in any reservoir built in whole or in part with Federal funds is the responsibility of the Corps of Engineers. Projects for which operating rules and regulations have been developed are referred to as "Section 7 Projects."

Small Reclamation Project Act of 1956 as amended, established a program under which non-Federal interests can

obtain loans for small reclamation projects. In cooperation with the U.S. Bureau of Reclamation, the Corps of Engineers assists in analyzing and evaluating proposed projects when flood control is a function.

Watershed Protection and Flood Prevention Act of 1954. Under the authority of this act, as amended, the Soil Conservation Service constructs dams and other facilities in headwater areas for a variety of purposes including flood control. The Corps of Engineers cooperates with the Soil Conservation Service in carrying out this program.

Navigation Projects

Navigation projects are directed by Congress to assist in the development and conduct of waterborne commerce. The Corps now has no navigation projects in Nevada.

Beginning with an act approved May 24, 1824, investigations and improvements for navigation and related purposes have been authorized by a series of river and harbor acts, from which basic policies and procedures have been established. The 1920 River and Harbor Act (Public Law 66-263) expanded the Federal policy regarding navigation improvements and established general requirements for local cooperation where the benefits from such improvements are mainly local in nature. Subsequent acts have further clarified and expanded the Federal policy and have authorized many specific navigation projects.

Section 117 of the 1968 River and Harbor Act (Public Law 90-483) permits the Corps to maintain navigation channels in excess of authorized project depths when such excess depths were provided for defense purposes and also serve essential needs of general commerce. Section 6 of the 1974 Water Resources Development Act (Public Law 93-251) provides that the cost of operation and maintenance of the

Federal participation in the cost of partnership projects must be specifically authorized by Congress in a Flood Control Act. The Federal contribution is determined by detailed cost allocation studies and reflects the flood control accomplishment to be realized. It excludes cost for other functions as well as the Federal expenditures for studies and administration of funds. Partnership projects are operated for flood control according to rules and regulations established by the Corps of Engineers.

Recreational Development

Outdoor recreation is recognized by the Corps of Engineers as a tangible and important function of water resources development, and it is given the same consideration as other needs and potentialities in planning of water resources development projects. Corps participation in recreational development was authorized by Section 4 of the 1944 Flood Control Act (Public Law 78-534), as amended by the Flood Control Acts of 1946 (Public Law 79-526); 1954 (Public Law 83-780); 1960 (Public Law 86-645), and 1962 (Public Law 87-874). Under these Continuing Authorities, the Corps of Engineers constructs, operates, and maintains

public park recreational facilities at water resources development projects under its control, and may permit construction, operation, and maintenance of such facilities by local interests. Recreational facilities for public use are generally provided through cooperative efforts of the Corps of Engineers and a non-Federal agency, and when appropriate, by private interests. The 1965 Federal Water Project Recreation Act (Public Law 89-72), as amended by Section 77 of the 1974 Water Resources Development Act (Public Law 93-251), authorizes the Corps of Engineers to participate and cooperate with states and local interests in developing the recreational potential of any Federal water project.

Under the act, the Federal Government assumes responsibility for major recreational development provided that non-Federal public bodies agree in advance to administer project land and water areas of recreation or fish and wildlife enhancement; to bear not less than one-half the separable costs of the project allocated to recreation and one-quarter of such costs allocated to fish and wildlife enhancement; and to bear all the costs of operation, maintenance, and replacement.

Public use of land and water areas at Corps storage projects in the past decade has more than tripled. Facilities provided for public use include access roads, boat-launching ramps, parking areas, observation points, picnic areas, campgrounds, and water supply and sanitation systems. Provisions are also made for the preservation and enhancement of fish and wildlife resources in accordance with the 1958 Fish and Wildlife Coordination Act (Public Law 85-624). Facilities and services — such as motels, boatels, restaurants, marina installations, and sporting-goods stores — generally are provided (not as part of the project) on adjacent private lands, although such facilities are sometimes part of the overall plan of improvement and are located on Federal lands on a concessionaire basis. Some flood detention basins, which generally do not have permanent recreation pools, have recreational facilities including bridle paths, hiking trails, golf courses, archery ranges, playgrounds, day-camping and picnicking facilities, as appropriate, may be provided in conjunction with levee and channel improvement projects.

Water Pollution and Water Quality Control

Water pollution and water quality control are given full consideration in the planning and construction of Federal water resources development projects under the 1948 Water Pollution Control Act (Public Law 80-845), as amended by various acts, including the 1956 Water Pollution Control Act Amendments (Public Law 84-660); the 1965 Water Quality Act (Public Law 89-234); the 1966 Clean Water Restoration

Act (Public Law 89-753); the 1970 Water Quality Improvement Act (Public Law 91-224); the 1972 Federal Water Pollution Control Act Amendments (Public Law 92-500); the 1974 Water Resources Development Act (Public Law 93-251), the Clean Water Act of 1977 (Public Law 95-217), and other related legislation and certain executive orders. In water storage projects, adequate capacity may be included for regulation of streamflow to maintain high water quality, but not as a substitute for treatment or other methods of controlling pollution at the source. Further, Corps of Engineers' policy provides that improvements and facilities be designed, equipped, and maintained to ensure that they will not become sources of pollution of the air, land, or water.

Development of Domestic, Municipal, and Industrial Water Supplies

The 1958 Water Supply Act (Public Law 85-500), as amended, permits the Corps of Engineers to participate and cooperate with the states and local interests in developing domestic, municipal, and industrial water supplies in connection with the construction, maintenance, and operation of Federal navigation, flood control, irrigation, and multiple-purpose projects. Space for storage of municipal and industrial water supplies may be included in Corps' storage projects if local interests agree to pay the percentage of project costs allocated to that function.

Regulatory Functions

Sections 9 and 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act are the main authorities that designate the Corps of Engineers as the agency responsible for protecting and preserving our country's waterways. Under these laws, permit programs have been established to control construction and operations in navigable waterways, and regulate discharge of dredged or fill materials in waters and adjacent wetlands of the United States.

Flood Plain Management Services

Man's continual encroachment into flood plain areas periodically needed for passage of floodflows has created a



need for information on the flood hazards thus created. In recognition of this need, Section 206 of the 1960 Flood Control Act (Public Law 86-645), as amended by the 1966 and 1970 Flood Control Acts and the Water Resources Development Act of 1974 (Public Law 93-251), authorizes the Corps of Engineers to identify areas subject to periodic inundation by floods of various magnitudes and frequencies, to establish general criteria for guidance in the use of flood plains, to disseminate these data to interested agencies and individuals, and to provide technical services including engineering advice for use in planning local programs aimed at reducing flood hazards to life and property.

Flood Plain Information Reports. Flood plain information studies and reports have been a major segment of the Corps of Engineers' effort. A large volume of flood hazard data was developed and assembled in a readily usable format. Flood-insurance studies further increased the flood hazard data available in background information files. Under the National Flood Insurance Program, the Federal Insurance Administration (FIA) has responsibility for providing flood-prone communities with maps showing flood hazard areas. Therefore, flood plain information studies and reports have been phased out to eliminate any duplication of effort. This permits increased emphasis and availability of service in the areas of technical assistance and flood plain management planning.

Flood Hazard Reports. The Corps prepares flood hazard reports at the request of Federal and local agencies requiring flood hazard information and specific locations wherever buildings, roads, or other facilities are federally owned, federally financed, or involved in federally administered grant, loan, or mortgage insurance programs, and wherever disposal of Federal land and property is involved.

Technical Services and Guidance. Upon request, the flood plain management services of the Corps make available to Federal and non-Federal agencies information, guidance, and advice on flood hazards. This service includes guidance in interpreting data in flood plain information reports and flood insurance studies, delineating floodways, preparing flood plain regulations, and providing additional data in response to public and private inquiries. It also provides guidance on floodproofing and locating public buildings, subdivisions and other land uses. Upon request, government agencies are provided technical and engineering assistance in developing structural and non-structural methods for preventing or reducing flood-related damages.

A recent addition to this service is the conducting of emergency flood/hazard evacuation studies in response to State and local requests. This type of study develops a site specific emergency warning and evacuation plan, including routings to designated temporary shelters, and provides the basis for a post-recovery plan. This service also provides responses to individual requests for any information that may be available within the district office.

The 1968 National Flood Insurance Act (Public Law 90-448), as amended by the 1973 Flood Disaster Protection Act (Public Law 93-234), authorized the Department of Housing and Urban Development (HUD) to establish a national flood insurance program and to use the services of

certain other Federal agencies, on a reimbursable basis, in carrying out the program. In 1979, the FIA's functions were transferred to the Federal Emergency Management Agency (FEMA) from HUD. The Corps is performing contractual work under the National Flood Insurance Program and is supporting the FIA by providing data to municipalities for this use in establishing a regulatory program and to qualify their residents for flood insurance.

Other Special and Continuing Authorities

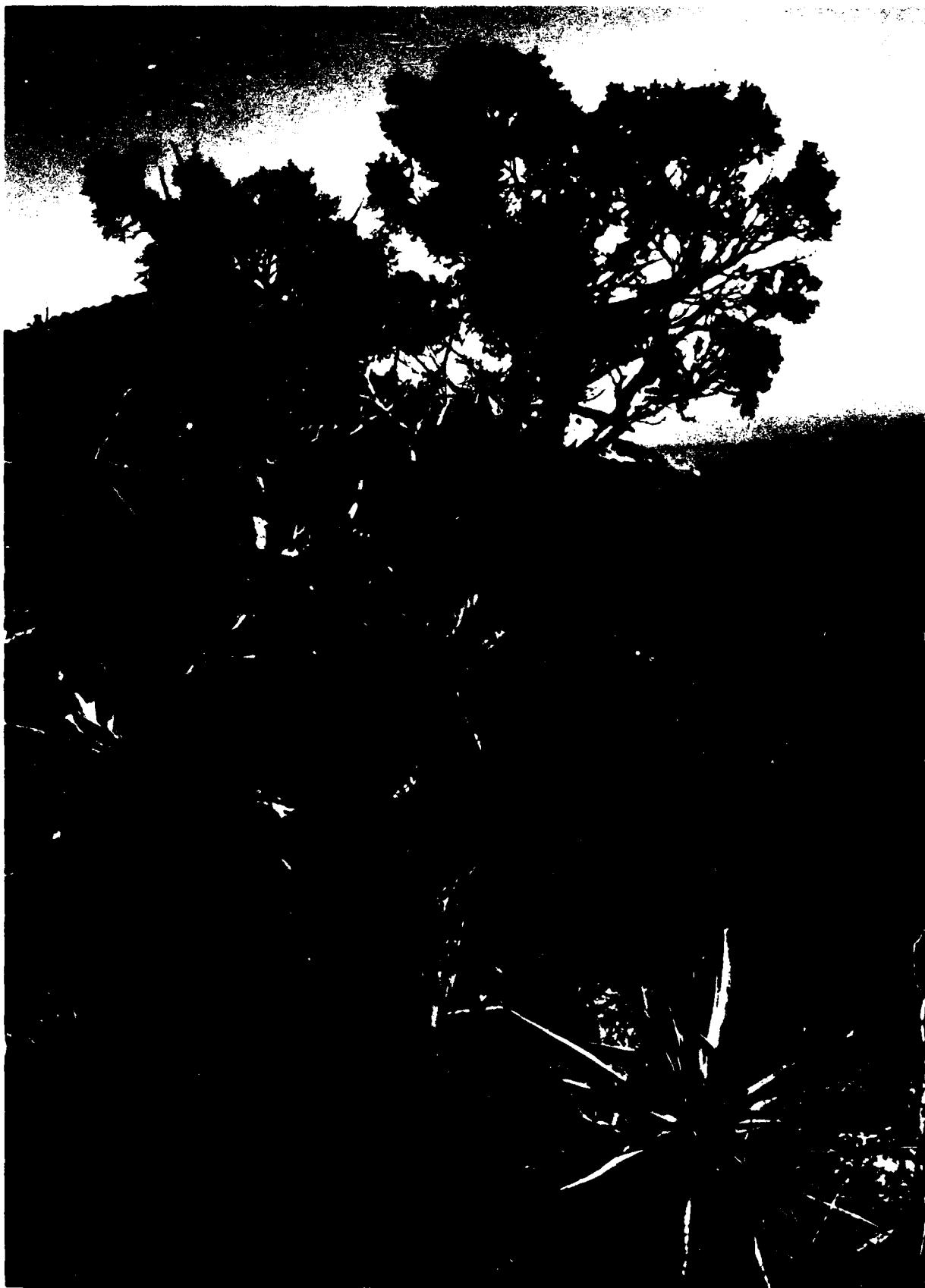
Continuing Authorities Program

At the request of local agencies, the Corps of Engineers may undertake projects where problems are generally "small" in scope and varied emergency work, without specific Congressional authorization, under Continuing Authorities. The Continuing Authorities program allows the Corps to respond more quickly than is possible through the specific Congressional authorization process. This is because Congress has given the Corps general authority to study and, if proven feasible, to construct certain water resources development projects. Also, the Corps may reevaluate operating and environmental aspects of projects when changes in conditions so warrant; and may work on other agencies' projects.

The program includes seven different types of projects, each with its own project authority and strict limit on the amount of federal funds that can be spent.

Continuing Authorities projects, when approved by the Chief of Engineers, and constructed under specific project authorities, must be complete in themselves, constitute a complete solution to the problem, and not commit the Federal Government to additional improvements. These projects are subject to the same requirements of feasibility, economic justification, cost-sharing, and compliance with the National Environmental Policy Act, as projects that require the specific authorization of Congress. They must be coordinated with the state or other local interests concerned. They are based upon favorable reconnaissance-type investigations and subsequent detailed project reports, which serve as bases for authorization of projects and preparation of plans and specifications. The project allotments, made annually by Congress on a lump-sum, nationwide basis, cannot exceed \$40 million for flood control projects or \$35 million for navigation projects for any one year.





Creosote vegetation is found in abundance in Red Rock Canyon recreational area, Toquima Range. (Photo by Gary W. Gaynor, U.S. Army Corps of Engineers)

Summary of Continuing Project Authorities

Project	Authority	Federal Limit
Flood Control	Section 205, 1948 Flood Control Act, as amended	\$5,000,000
Emergency Streambank and Shoreline Protection	Section 14, 1946 Flood Control Act, as amended	500,000
Snagging and Clearing for Flood Control	Section 208, 1954 Flood Control Act, as amended	500,000
Navigation	Section 107, 1960 River and Harbor Act, as amended	4,000,000
Mitigation of Shore Damages Attributable to Navigation Works	Section 111, 1968 River and Harbor Act, as amended	2,000,000
Beach Erosion	Section 103, 1962 River and Harbor Act, as amended*	2,000,000
Snagging and Clearing for Navigation	Section 3, 1945 River and Harbor Act**	1,000,000

* May be exceeded with specific Congressional authorization.

** Annual program limit of \$1,000,000.

Flood Control (Section 205). Work under this authority provides for local protection from flooding by the construction or improvement of flood control works such as levees, channels, and dams. Nonstructural alternatives are also considered and may include measures such as installation of flood warning systems, raising and/or floodproofing structures, and relocating flood-prone areas.

Emergency Streambank and Shoreline Protection (Section 14). Work under this authority is intended to prevent erosion damages to Federal, State, and local facilities such as highways, bridge approaches, public works, and other nonprofit public facilities by the emergency construction or repair of streambank and shoreline protection works.

Snagging and Clearing for Flood Control (Section 208). This authority provides for channel clearing and excavation, with limited embankment construction using materials from the clearing operation only.

Navigation (Section 107). Dredging channels, widening turning basins, and constructing navigation aids are permitted under this authority.

Mitigation of Shore Damages Attributable to Navigation Works (Section 111). Work under this authority provides for the prevention or mitigation of erosion damages to public or privately owned shores along the coastline of the United States when these damages are a result of a Federal navigation project. This authority cannot be used for shore damages caused by river-bank erosion or vessel-generated wave wash. It is not intended to restore shorelines to historic dimensions, but only to reduce erosion to the level that would have existed without the construction of a Federal navigation project. Cost sharing is not required for this program. If the Federal cost limitation is exceeded, specific Congressional authorization is required.

Beach Erosion Control (Section 103). Work under this authority provides for protection or restoration of public shoreline by the construction of revetments, groins, and jetties, and may also include periodic sand replenishments.

Clearing and Snagging for Navigation (Section 3). This authority provides emergency measures to clear and remove obstructions to navigation in rivers, harbors, and waterways. No widening or deepening of channels, or recurring maintenance is included.

Emergency Operations

The Corps of Engineers undertakes emergency flood control work under the following Continuing Congressional Authorities with funds appropriated annually. Emergency flood control work projects need not be specifically authorized, but they must be economically and environmentally feasible as are specifically authorized projects.

Public Law 84-99. Within the limit of available funds, the Corps is authorized to engage in floodfighting and rescue operations, and to repair or restore flood control works threatened or destroyed by floods. Repairs or restoration of flood control works includes strengthening or otherwise modifying damaged or threatened flood control structures to ensure adequate functioning.

Public Law 93-288. Under this authority, also known as the Disaster Relief Act of 1974, the Federal Emergency Management Agency (FEMA) coordinates the relief and recovery activities of all Federal agencies during major disasters (disasters beyond the capability of local and state resources.) During such disasters declared by the President, FEMA may request the Corps of Engineers to act as an engineering and construction agency to rehabilitate or restore damaged or destroyed facilities, prepare evaluation reports on requests to FEMA for repayment of local costs for repair and restoration work, inspect such work on its completion,

or perform other disaster recovery and relief activities.

Within the scope of the Continuing Authorities, the Corps is involved in the following:

Disaster Preparedness. State and local governments are responsible for flood emergency preparedness, including training and stockpiling of floodfighting supplies. The role of the U.S. Army Corps of Engineers is to supplement the maximum efforts of the state during a flood emergency.

The Corps participates in disaster preparedness through planning, training, stockpiling floodfighting supplies, maintaining an organization capable of responding quickly to all disasters, and by inspection of completed flood control projects.

Advance Measures Prior to Predicted Flooding. Advance measures consists of those activities performed prior to flooding or floodfighting to protect against loss of life and damage to improved property from flooding. There must be an immediate threat of flooding present before advance measures can be considered. The threat must be of a nature that if action is not taken immediately, damages will be incurred.

Emergency Operations. In time of flood or coastal storm, emergency operations will be undertaken by the Corps of Engineers to supplement local efforts in the following general categories: disaster assistance, disaster fighting, and disaster recovery or rehabilitation. Emergency measures are of a temporary nature designed to meet the imminent threat of flooding and to preserve existing protective works. No authority exists, however, to reimburse locals for costs of their own emergency activities.

Repair of Flood Control Projects Damaged by Floods. The Corps of Engineers is authorized to investigate and perform emergency repairs to all flood control works, and federally authorized and constructed hurricane and shore protection projects, when these projects are damaged by floods or unusual coastal storm.

Contaminated Water Assistance. The Corps is authorized to provide clean drinking water to communities with contaminated water supplies which are causing or likely to cause a substantial threat to the public health and welfare. Contamination may have resulted from deliberate, accidental, or natural events including flooding.

Drought Assistance. Within areas determined to be drought distressed, the Corps has the authority to construct wells and to transport water to farmers, ranches, and political subdivisions. Assistance may be provided when the Secretary of the Army determines that there is substantial threat to the health and welfare of the inhabitants of the area including threat of damage or loss of property.

Reevaluation of Completed Projects

Section 216 of the 1979 Flood Control Act authorized the Corps of Engineers to review completed navigation and flood control projects when significant changes in physical and economic conditions warrant such a review. The findings of these review investigations are reported to Congress with recommendations for modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.

Cooperation in Projects of Other Agencies

Section 7 of the 1944 Flood Control Act assigned the Secretary of the Army the responsibility for prescribing regulations for the use of storage space reserved for flood control or navigation in all reservoirs constructed wholly or in part with Federal funds. In carrying out that responsibility, operating regulations for flood control space are developed cooperatively with the U.S. Bureau of Reclamation. The Corps of Engineers also cooperates in the Watershed Studies Program of the Soil Conservation Service and the Small Reclamation Project Program of the Bureau of Reclamation.

When authorized by Congress, in recognition of flood control accomplishments, the Federal Government may contribute that part of the construction cost allocated to flood control, as determined by detailed cost-allocation studies. Dams and reservoirs built under this arrangement are known as "Section 7" projects, and must be operated for flood control according to regulations established by the Corps of Engineers.

Projects Approved by Public Works Committees

Section 201 of the 1965 Flood Control Act (Public Law 89-298), as amended by the 1976 Water Resources Development Act (Public Law 94-857), authorizes the Secretary of the Army, acting through the Chief of Engineers, to construct water resources development projects — including single- and multiple-purpose projects involving navigation, flood control, and shore protection — if the estimated Federal first cost of construction is less than \$15,000,000.



Funds, however, cannot be appropriated until the project is approved by resolutions adopted by the Committees on Public Works of the Senate and House of Representatives. The projects are subject to the same requirements of feasibility, economic justification, cost sharing, and compliance with the National Environmental Policy Act as projects that must be authorized by the full Congress.

Project Deauthorization

Section 1001 of the Water Resources Development Act of 1986 (Public Law 99-662) provides a procedure for deauthorization of projects authorized by this act that have not obligated construction funds for 5 years after the date of enactment of this act.

Investigations and Reports for Flood Control and Related Purposes

Investigations and reports on water resources problems are the foundation of the civil works program of the Corps of Engineers. As briefly described in the introduction to this booklet, such investigations must either be specifically authorized by Congress or carried out in accordance with a continuing congressional authority.

In the evolution of water resources development planning, it has become evident that most of the water resources services of the future must be oriented to an urban-oriented society with a large part of the population concentrated in politically independent but contiguous urban-suburban areas. Accordingly, in the on-going and future general investigation program of the Corps, high priority will be given to studies that are now oriented or can be oriented to the resolution of water and related problems of urban areas of the country. Problems of particular concern in this new orientation of the Corps' mission are:

- Urban flood control, comprehensive urban-site development, and flood plain management.
- Lake and ocean protection and estuarine planning.
- Regional waste water and water supply management systems.
- Renewal of urban riverfronts and waterfronts.
- Recreation management including upgrading existing facilities and developing new facilities.

Investigations and reports on water resources problems addresses three primary questions: Is there a water resources problem or need in the study area? Is there a solution to the problem that is engineeringly, economically, environmentally, and socially feasible and that is acceptable to the affected community? Is there a Federal interest in solving the problem or meeting the need?

In about one-half of such studies conducted nationwide, a report recommending no Federal activity is submitted. If,

however, the study indicates an action that can and should be taken on the part of the Federal Government, a detailed report is submitted upon which Congress can base action on authorization of a Federal water resources development project or other appropriate program, and an environmental impact statement is filed with the Council on Environmental Quality. The processing of authorized investigations is controlled by policies and procedures established for guidance of the Corps of Engineers, and involves a high level of public participation.

Congress has directed that investigations and reports for flood control and drainage include consideration of other related problems. Thus, in addition to the study of flood damages and means for their prevention or reduction, careful consideration is given to the possibility of developing projects that will provide water for irrigation, domestic and industrial use, and generation of hydroelectric power; preserve and enhance esthetic and ecological values; improve conditions affecting navigation and fish and wildlife; prevent saltwater intrusion; develop recreational resources; enhance land values; preserve, protect, mitigate, or enhance social values; or improve other conditions related to the control and use of water. Consequently, multiple-purpose projects are developed that not only provide protection against floods, but also serve one or more of the other purposes mentioned. Normally, the cost of multiple-purpose projects is significantly less than the total cost of separate, single-purpose projects that would provide comparable benefits. Costs allocated to purposes other than flood control and recreational and fish and wildlife development are borne by the interests desiring inclusion of those additional features in the project plans unless such purpose is of national significance. The cost of recreational and fish and wildlife development is shared under the provisions of the 1965 Federal Water Project Recreation Act (Public Law 89-72), as amended by Section 77 of the 1974 Water Resources Development Act (Public Law 93-251).

Section 22 of the 1974 Water Resources Development Act (Public Law 93-251) permits the Corps to cooperate with any state in preparing comprehensive plans for the development, utilization, and conservation of the water and related resources of drainage basins within the boundaries of the state and to submit to Congress reports and recommendations with respect to appropriate Federal participation in carrying out such plans. This permits the Corps to assist the various states in developing their comprehensive plans.

Section 150 of the 1976 Water Resources Development Act (Public Law 94-587) authorizes the Corps to plan and establish wetland areas as part of an authorized water resources development project under its jurisdiction. Establishment of any wetland area in connection with the dredging required for such a water resources development project may be undertaken in any case where (1) environmental, economic, and social benefits of the wetland area justify the increased cost above the cost required for alternative methods of disposing of dredged material for such a project; (2) the increased cost of such wetland area will not exceed \$400,000; and (3) reasonable evidence exists that the wetland area to be established will not be substantially altered or destroyed by natural or man-made causes. All reports submitted to Congress will include, where appropriate, consideration of the establishment of wetland areas.

Six Steps to a Civil Works Project

Each civil works project moves through six major steps from conception to operation. These steps carry the typical project through the planning, design and implementation stages of engineering. A project usually starts with a local perception that a water resources problem exists in a specific location. Local officials approach one of the Corps' district offices to inquire if some form of Federal assistance may be available.

A detailed description of this process appears in a brochure entitled, "Six Steps to a Civil Works Project." This brochure is available to the public from one of Corps offices listed at the front of this booklet. A summary of the six steps follows:

Step	Description	
1 Problem Perception	Local community (i.e., people, businesses) and/or local government perceive or experience water and related land resource problems (i.e., flooding, shore erosion, navigation restrictions, etc.). Problems are beyond local community's/government's capabilities (e.g., jurisdictional boundaries, financial resources, technical expertise, etc.) to alleviate or solve.	vided in annual Energy and Water Development Appropriations Act.
2 Request for Federal Action	Local officials talk to Corps about available Federal programs. Technical assistance and some small projects can be accomplished without congressional authorization (see Continuing Authorities Program).	District conducts reconnaissance phase, leading to a reconnaissance report.
	Local officials contact congressional delegation if study authorization required.	Because most Corps' projects involve cost sharing and environmental issues, local proponents should seek an early consensus for or against a Corps' project among the public and private sectors and among diverse interest groups.
3 Study Problem and Report Preparation	Member of Congress requests study authorization through Public Works Committee. Committee resolution adopted if report was previously prepared on water problems in area. Legislation, which may be proposed by the President, is normally required if no Corps report exists.	If study continues beyond reconnaissance phase, local sponsor must agree to share cost of feasibility phase.
	Study is assigned to Corps district office. Funds to Complete 12-18 months reconnaissance phase included in President's budget.	Public involvement is an integral part of planning process, including review of draft report and draft environmental impact statement (EIS).
4 Report Review and Approval	Appropriations for reconnaissance pro-	Study is conducted under the U.S. Water Resources Council's Economic and Environmental Principles and Guidelines (see Principles and Guidelines) for Water and Related Land Resources Implementation Studies, dated March 10, 1983.
		Funds are included annually in President's budget; annual appropriations and non-Federal monies are needed to continue study.
		Study results in Definite Project Report and EIS which are submitted to Corps division (regional) office.
		Division office, which reviews district work during planning process, completes technical review of final district Definite Project Report and EIS.
		Division engineer submits report to review board or commission and issues public notice inviting comments.
		Board of Engineers for Rivers and Harbors (BERH) or Mississippi River Commission (MRC) conducts review of report and submits views and recommendations to Chief of Engineers.
		Comments from public are fully considered in BERH or MRC action.
		Proposed report of Chief of Engineers and final EIS are sent to heads of Federal agencies and governors of affected states for comment.
		Final EIS is filed with Environmental Protection Agency (EPA) and made available to public.

5 Congressional Authorization

Chief of Engineers' report (see Step 4) is referred to Committee on Public Works and Transportation in House and Committee on Environment and Public Works in Senate.

Civil works projects are normally authorized by Water Resources Development Act (Omnibus Bill) following committee hearings.

Occasionally, Corps' proposal is authorized by separate legislation or as part of another bill or, in cases where estimated Federal cost is \$15 million or less, by committee resolutions.

6 Project Implementation

New projects are included in President's budget based on national priorities and anticipated completion of design and plans and specifications so that construction can be awarded.

Budget recommendations are based on evidence of support by state and ability and willingness of non-Federal sponsors to provide their share of project cost.

Chief of Engineers considers comments on proposed report and EIS, prepares final report, and submits it to Secretary of the Army.

Chief of Engineers' report is reviewed by Assistant Secretary of the Army (Civil Works).

Office of Management and Budget (OMB) comments on report as it relates to President's programs.

Assistant Secretary of the Army (Civil Works) transmits Chief of Engineers' report to Congress.

In some cases, Corps continues planning, engineering, and designing pending Congressional authorization of proposal. This process is called Preconstruction Engineering and Design (PED), and includes the General Design Memorandum (GDM) and the plans and specifications for the first contract.

Division offices and, in some cases, Office of the Chief of Engineers, review the GDM, the Feature Design Memorandum (FDM), and plans and specifications.

Congress appropriates Federal share of funds for new starts; normally, this occurs in annual Energy and Water Development Appropriations Act.

Secretary of the Army and appropriate non-Federal sponsors sign formal agreement once Congress has appropriated funds for project implementation to begin.

Agreement obligates non-Federal sponsors to participate in implementing, operating, and maintaining project according to requirements established by Congress and administration.

District completes enough engineering and design for developing plans and specifications for initial project implementation.

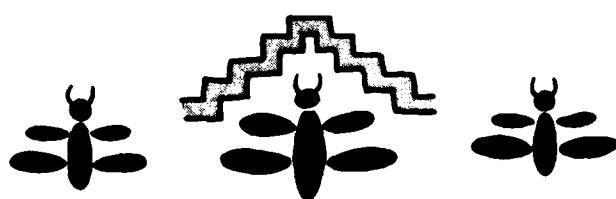
Engineering and design continue during implementation process; plans and specifications are reviewed by division offices and sometimes by Office of the Chief of Engineers.

Funds are included in President's annual budget for the Federal share of the project; appropriations are required to continue design and implementation.

Construction is managed by Corps, but done by private contractors.

Most projects are operated and maintained by non-Federal sponsors as part of agreement signed prior to implementation. However, funds are requested in President's annual budget for the Federal share where there is a need for continuing Federal financing of project operation and maintenance; congressional appropriations are required for such funds.

Corps periodically inspects projects, including those for which non-Federal sponsors have assumed an operation and maintenance responsibility.



How Local Interests Share in Federal Projects

The Water Resources Development Act of 1986 has significantly altered the role of local interests in Federal projects. Costs to the local sponsor during construction vary according to the type of project, but, as in the past, include lands, easements, rights-of-way, and relocation for all projects.

For navigation projects, the local sponsor is also responsible for paying:

1. Ten percent of the cost of construction of the portion of the project which has a depth not in excess of 20 feet.
2. Twenty-five percent of the cost of construction of the portion of the project which has a depth in excess of 20 feet but not in excess of 45 feet.
3. Fifty percent of the cost of construction of the portion of the project which has a depth in excess of 45 feet.

The local sponsor is required to pay, over 30 years, an additional 10 percent of the cost of general navigation features. The value of lands, easements, rights-of-way, relocations, and dredge disposal areas may be credited toward this payment. The local sponsor is required to provide dredged material disposal areas necessary for the project.

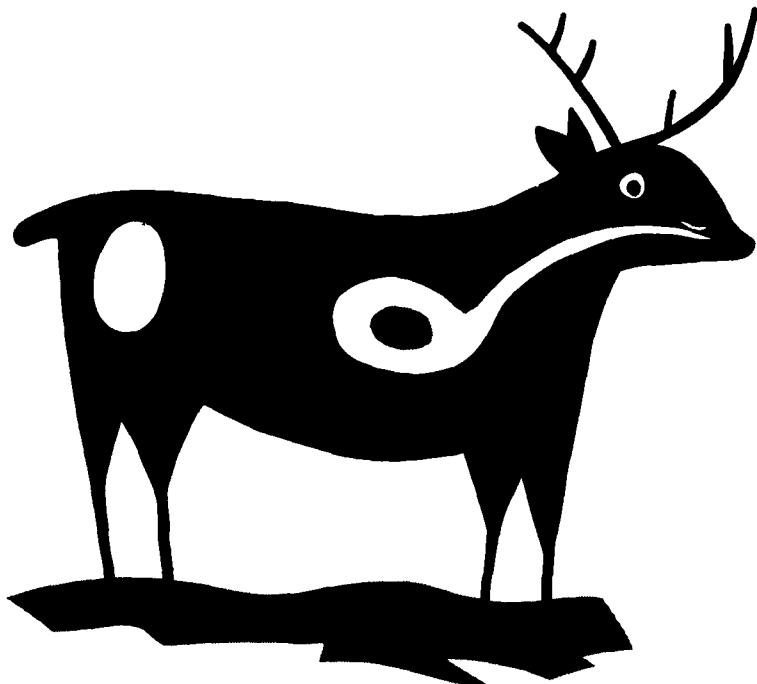
For flood control projects, the non-Federal interests are also responsible for paying:

1. Five percent of the costs allocated for flood control in cash upfront.
2. An additional amount as necessary to bring costs allocated to flood control to 25 percent, including the value of lands, easements, rights-of-way, and relocations.
3. One-half of recreational costs and all costs of operation and maintenance of facilities.
4. All costs of operation, maintenance, and replacement of flood control facilities.

Cost-sharing of feasibility studies — 50 percent, Federal; 50 percent, non-Federal — was implemented by the Corps on March 15, 1986.

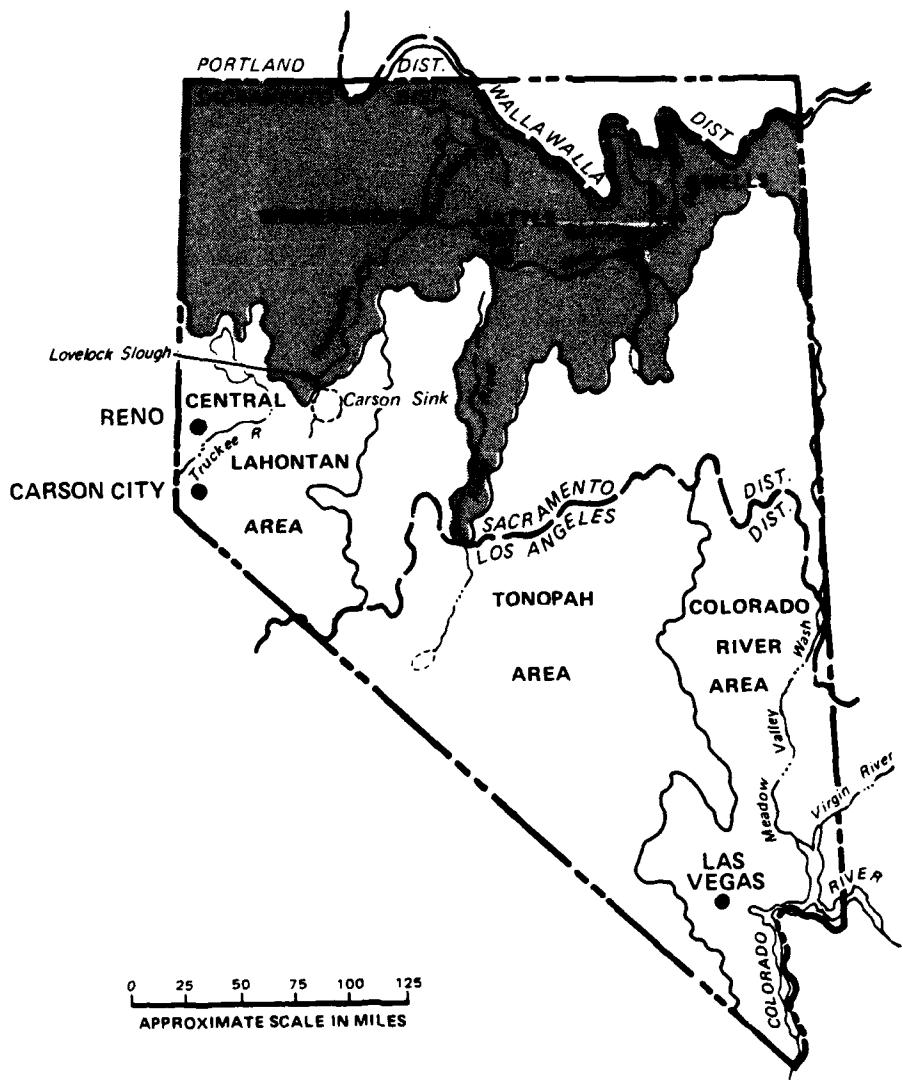
To meet the requirements of local cooperation in any project, local interests must be represented by a legally constituted sponsoring agency. Such an agency must be a local governmental unit or special district with legal authority and financial ability under state statutes to meet local-cooperation requirements.

When notifying their Senator or Representative of their desire for Federal cooperation in water resources improvements, local interests should determine whether such a sponsoring agency exists or can be legally formed. If the legal authority does not exist, local interests should take action to obtain the enabling legislation necessary to establish such an agency.



Chapter 2





Humboldt River Area

The Humboldt River Area consists of the river's drainage area plus a series of closed basins and desert playas in the northwestern part of the State; it is a closed area with no outlet to the sea, comprising about 29,900 square miles. The Humboldt River is the most important stream in the area and one of the largest stream systems in the State. It rises in the mountains of northeastern Nevada near the town of Wells and, for about two-thirds of its length, flows westward and thence southward to its terminus in Humboldt Lake and Carson Sink, which are remnants of prehistoric Lake Lahontan.

The Humboldt River Area is a high plateau crossed by numerous steep mountain ranges separated by broad, flat valleys. The mountain ranges generally trend north to northeast, and their crests are typically 3,000 to 5,000 feet above the adjacent valley floors. Elevations range from about 4,000 feet in the Carson Sink and in the valley-floor areas of many of the closed basins to about 12,000 feet in the highest headwaters of the Humboldt River.

The climate is largely semiarid with extremes in temperature and precipitation. Winters are long and cold, and summers are short and hot. Most annual precipitation occurs from October through May. Violent, local cloudburst storms occasionally occur during the warm months of July through September. Annual precipitation, which ranges from about 8-12 inches in the valley-floor areas to about 25-30 inches in the high headwater and mountain areas, averages about 10 inches. Most winter precipitation occurs in the form of snow. Temperatures are characteristic of those found in arid mountain areas. Definite variations occur with both altitude and latitude, and actual temperatures depend upon the local exposure characteristics. In general, average summer maximums range from 85° to 95°F. in the lower valleys, and from 65° to 75°F. in the higher mountain valleys. Summer minimums generally range from 45° to 55°F. Winter maximums range from 35° to 45°F. over most of the area. Winter minimums range from 10° to 20°F., and the number of days with minimum temperatures below freezing averages from 150 to 200.

In general, the Humboldt River Area is sparsely populated. Its present population of about 44,500 is expected to increase to about 56,000 by 2000. The principal centers of population are Elko (10,800) and Winnemucca (5,300). The economic base of the Humboldt River Area is agriculture and mining, with most agriculture activity associated with the livestock industry, and almost all irrigated crop production used to support the production of beef and lamb. The area is served by Interstate Highway 80, U.S. Highways Nos. 93 and 95, State highways, and the main lines of the Western Pacific and Southern Pacific railroads. Western Airlines maintains daily flights to Elko.

Floods in the Humboldt River Area result from rapidly melting snow during late spring and early summer; from general rains during the winter; and from local, summer cloudburst storms. Substantial flood damage can be expected in the future unless flood-damage-reduction programs are undertaken. Also, additional water supply for irrigation and other uses is needed. It can be obtained from groundwater

and, to a limited extent, by regulation of surface streamflow. The recreational potential, except for big-game hunting and fishing, is largely undeveloped. Lack of development is principally due to the remoteness of the area and the difficulty of access to the back country.

Multiple-Purpose Storage Project

Humboldt River and Tributaries Project (Sacramento District)

The Humboldt River and tributaries project was authorized by Congress in 1950. The project, as authorized, provided for construction of storage reservoirs on the three principal tributaries of the Humboldt River. The reservoirs would consist of Hylton Lake on the South Fork of the Humboldt River, Devil's Gate Lake on the North Fork of the Humboldt River, and Vista Lake on the Marys River. These reservoirs would be operated primarily for flood control, but would also be operated for irrigation, recreation, and fish and wildlife purposes.

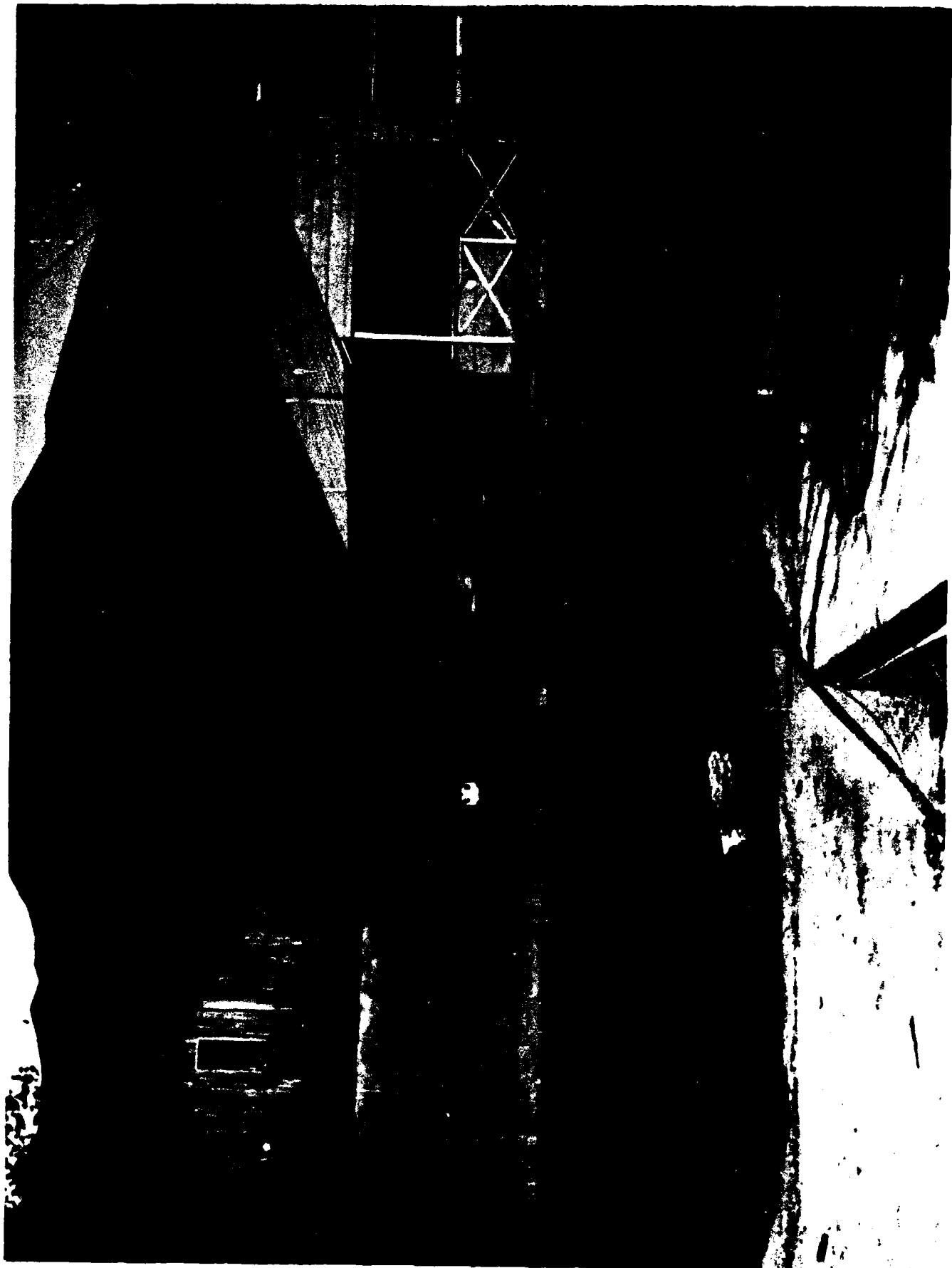
This project was deauthorized by the Water Resources Development Act of 1986.



Winter snows cover peaks of Ruby Mountains, Elko County.



Humboldt River east of Battle Mountain and Southern Pacific Railroad derailment May 1984.



Flooding of Humboldt River at East Second Street in Winnemucca, Nevada, in June 1984.



The Reese River levee, completed in 1968, protects the town of Battle Mountain from damaging floods.



The Reese River channel is at the left of the levee, with the Shoshone Mountains in the background.

Small Flood Control Project

Reese River Levee at Battle Mountain (Sacramento District)

A small flood control project for Reese River at the town of Battle Mountain, in Lander County, was authorized in 1965 and completed in 1968. The project, which is in the Humboldt River Basin, consists of about 7,200 feet of new levee along the east side of Battle Mountain.

A flood that occurred in February 1962 caused damages estimated at \$680,000 to residential and commercial property, highways, and utilities in and near Battle Mountain. Most of that damage would have been prevented if the project had been completed.

The Federal first cost of the project was about \$116,000, and the non-Federal first cost was about \$6,000 for lands, easements, and rights-of-way.

Lander County maintains the project.

Area. The work, which was done by the Sacramento District, is summarized in the following table:

Location	Type of work	Cost
Humboldt River	Emergency spillway, Rodgers Dam, Lovelock .	\$200,000
Humboldt Lake	Snagging and clearing . . .	25,000
Humboldt River	Levee repair	195,000
Humboldt River	do	130,000
	Snagging, clearing, and floodfighting	60,000
Little Humboldt River . . .	Snagging and clearing . . .	50,000
	Channel rectification (Operation Foresight*) . . .	17,000
Lovelock Slough	Snagging and clearing . . .	19,000
Reese River	Levee repair	3,000
Total		699,000

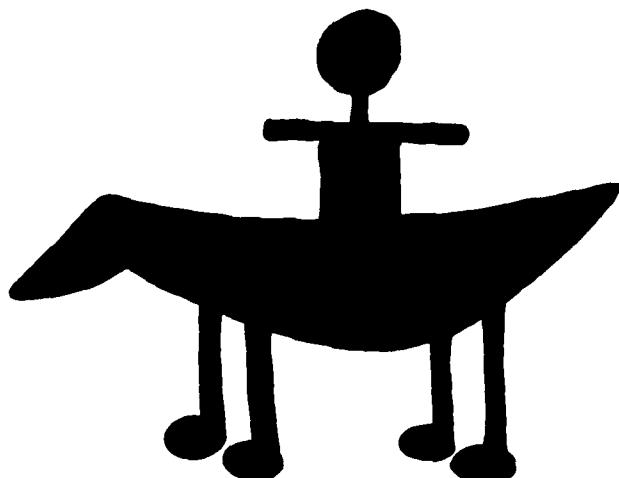
*Implemented by the Corps of Engineers after the President urged aggressive use of the Continuing Authorities under Public Law 84-99 to develop a program of flood prevention when near-record snowmelt flooding was expected early in 1969 and many areas of the Southwest.

Emergency Operations

Authority for the Corps of Engineers to perform emergency work is described in detail in Chapter 1, titled "The U.S. Army Corps of Engineers and Its Activities in Nevada." Emergency floodfighting and repair and restoration work under Continuing Authorities available to the Corps has totaled about \$700,000 in the Humboldt River

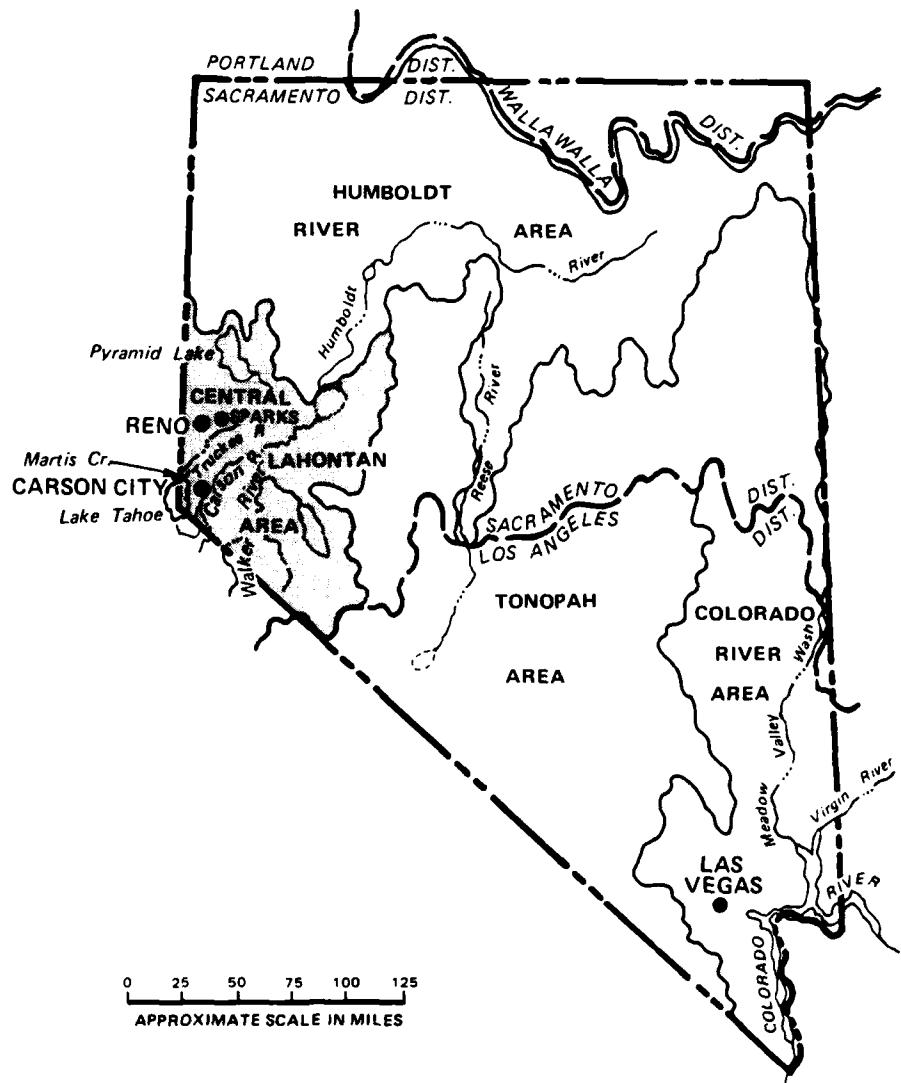
Cooperation With Other Agencies in Their Projects

The Nevada Department of Conservation and Natural Resources is currently constructing a compacted earth dam in the South Fork of the Humboldt River to create a reservoir for the South Fork State Recreation Area. Completion of the dam is scheduled for the spring of 1987.



Chapter 3





Central Lahontan Area

The Central Lahontan Area consists of the drainage areas of the Truckee, Carson, and Walker Rivers. These river systems rise on the forested eastern slopes of the Sierra Nevada in California and flow eastward into Nevada to terminate in lakes or sinks that are remnants of prehistoric Lake Lahontan. With about 9,500 square miles of land and 375 square miles of water, the area is the smallest in Nevada. With no outlet to the sea, this closed area includes a number of high mountain ranges interspersed with valleys, alluvial fans, lakes, irrigated croplands, and playas. Elevations range from maximums of 8,000 to 9,000 feet — with some higher mountain peaks — along the Nevada-California border to about 4,000 feet in valley-floor and playa areas.

Located here are some of the world's most spectacular scenic resources including Lake Tahoe, which is unique among high-altitude lakes of the world. Lake Tahoe — with its unusually clear, cold, sparkling water, deep blue in some parts and pale turquoise-blue in others — is a subalpine lake surrounded by high mountains largely covered by dense stands of timber. Another scenic resource area is Pyramid Lake, which provides a dramatic contrast to Lake Tahoe. Although both lakes are about the same size and one is the source and the other is the terminus of the Truckee River, Pyramid Lake is a desert lake set in a basin surrounded by harsh, bare mountains with only a sparse cover of hardy shrubs and other desert-type vegetation.

Climatic conditions in the Central Lahontan Area range from semiarid in the valley-floor and playa areas in the east to subalpine in the west. Annual precipitation, which varies with altitude, ranges from about 5 inches in the lower elevations to about 40 inches in the higher elevations. Most precipitation occurs during the period from November through March. Storms, however, may occur during the summer and early fall. Most precipitation in the headwater areas of the Truckee, Carson, and Walker Rivers occurs as snow that accumulates into a deep snowpack and supports perennial streamflow. Temperatures also vary with altitude, and it is possible to find wide variations within short

distances as a result of the extreme ranges in elevation. The most outstanding feature of temperature in this area is the extreme range between daily maximums and minimums. Ranges of 50°F or more are not uncommon.

Although the smallest in the Great Basin Region of Nevada, the Central Lahontan Area is second in population with a 1986 population of about 300,000, which is expected to increase to about 488,000 by 2000. A large part of the population is concentrated in the Reno-Sparks area (about 158,000) and in Carson City (about 36,600).

Although the economic base includes mining, stock raising, dairying, and crop production (primarily to support the livestock industry), the principal industry is tourist-oriented recreation. Extremely large numbers of visitors are attracted to this area by its natural beauty, varied year-round outdoor recreational activities, legal gaming, and performances of internationally known entertainers in the Reno-Sparks and Lake Tahoe areas. Because of Nevada's free-port law, wholesaling and warehousing are increasing in importance in the Reno-Sparks area. In general, the economy of the Central Lahontan Area is becoming more oriented to service activities than to primary or resource activities. The area is served by the Southern Pacific and Western Pacific railroads; Interstate Highway 80; U.S. Highways Nos. 50, 90, and 395; and a number of State highways. Several major airlines maintain scheduled flights to Reno.

Flooding is caused by rapidly melting snow during spring and early summer, by general rain during the winter and early spring, and by localized cloudburst storms during summer and early fall. Although Reno has been provided a moderate degree of protection from floods on the Truckee River, additional structural measures are required. Substantial future flood damage can be expected in other localities unless both structural and non-structural flood damage reduction programs are undertaken. Streambank erosion is a continuing problem along the lower Truckee River. A need exists for additional water supply for agricultural, municipal, and industrial uses. Additional electrical energy is required to meet pressing current needs as well as for future needs dictated by economic development and population growth.



Multiple-Purpose Storage Project

Martis Creek Lake (Sacramento District)



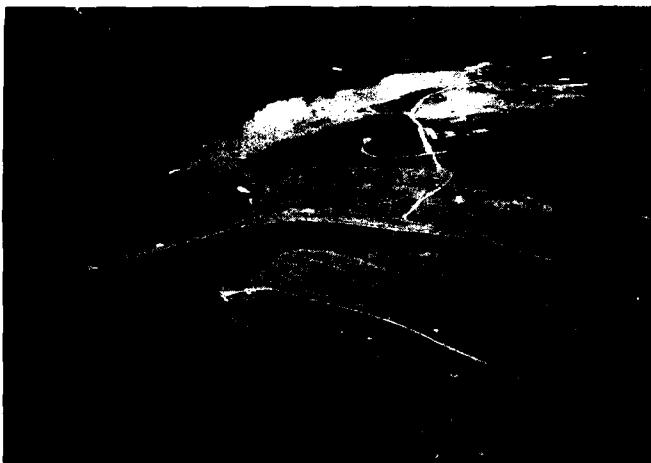
Two views of Lake Tahoe area in winter



The Martis Creek Lake project, which is in the Truckee River Basin, is on Martis Creek (in California) about 2 miles upstream from its confluence with the Truckee River and about 32 miles upstream from the City of Reno. The project consists of a dam and lake for flood control, recreation, and future water supply, and about 1 mile of channel improvement work by local interests along the Truckee River in Reno. Construction was started in 1967 and completed in 1972.

The dam, which is an earthfill structure with a crest length of 2,670 feet and height of 113 feet, forms a lake

with a gross capacity of 20,400 acre-feet. Water users will be required to reimburse the Federal Government for project costs allocated to the water supply function when this service is used. The drainage area upstream from the dam comprises 39 square miles.



Martis Creek Dam and Lake (May 1980)

The channel improvement work along the Truckee River in Reno consisted mainly of modifying and extending existing floodwalls to provide a flood-carrying capacity of 14,000 cubic feet per second through the city. These improvements were completed by local interests at their own expense.

The Federal first cost of the project was \$8,503,789, and the estimated non-Federal first cost (for channel improvement work) was \$100,000.

The Martis Creek Lake project is an important unit of the ultimate comprehensive plan for protection against floods in the Truckee River Basin. The project augments the protection against floods that is provided by U.S. Bureau of Reclamation projects in the basin. The U.S. Bureau of Reclamation projects reduce the frequency of flooding in Reno from an average of once in about 15 years to an average of once in about 30 years. Martis Creek Lake further reduces the frequency of flooding in Reno to once in about 60 years. The combination of projects produces a fairly high degree of protection against floods to Reno and some degree of protection in all reaches of the Truckee River between Martis Creek and Pyramid Lake. In addition, Martis Creek Lake provides needed recreational opportunities and, when required in the future, an additional source of water to augment the existing water supply storage in the Truckee River Basin.

Flood Control Project

Truckee River and Tributaries, California and Nevada (Sacramento District)

The Truckee River and tributaries channel improvements project provides for various improvements including enlargement of the Truckee River channel for a distance of about 3,200 feet downstream from the existing control structure at Lake Tahoe. The improvements permit greater lake releases

at higher stages than were possible under past conditions and reduce lakeshore damage during high lake stages.



Truckee meadows area along the Truckee River.

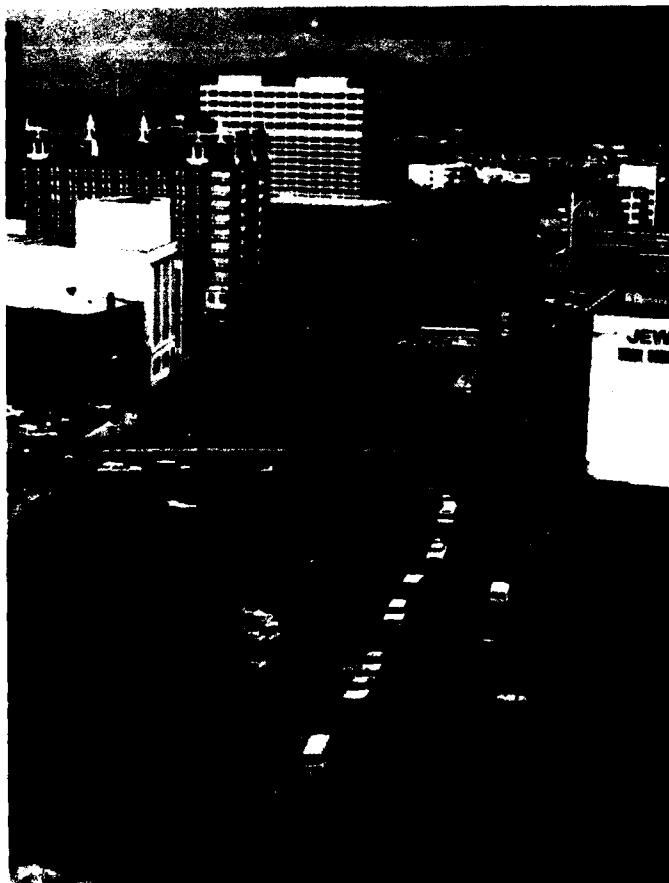
As a result of the greater releases from the lake, a small amount of flood control work was necessary between Lake Tahoe and the town of Truckee to prevent any increases in the frequency or severity of damages in that reach. The work consisted of providing low levees and channel improvements at intermittent locations. In addition, the Truckee River channel was enlarged for 7½ miles downstream from the Second Street bridge in Reno, thus in-

creasing the channel capacity from a minimum of about 3,000 cubic feet per second to 6,000 cubic feet per second. The work consisted of widening and straightening the channel, together with some steepening of the gradient and the removal of rock reefs obstructing flow. To compensate for increased flows through Truckee Meadows, the project includes improvement of the channel, chiefly by snagging and clearing at intermittent locations from Vista to Pyramid Lake.

Construction of the project was started in 1959, and channel improvements near Lake Tahoe and through Truckee Meadows downstream from Reno were completed in 1960. Additional channel improvements between Truckee Meadows and Pyramid Lake and in the vicinity of Sparks were completed in 1964 and 1968, respectively. The only work not completed comprises minor channel improvements at several locations between Lake Tahoe and Reno; this work has been deferred indefinitely at the request of the State of California. The project was constructed at a Federal first cost of \$1,039,000 and a non-Federal first cost of \$224,000.

The project provides partial protection against floods for residential property along the shore of Lake Tahoe and for about 7,500 acres of agricultural land along the Truckee River and in Truckee Meadows. The project is designed to fit into a basin plan for flood control and allied purposes, which includes the Martis Creek Lake project and certain features of the Washoe Reclamation and Truckee Storage Projects of the U.S. Bureau of Reclamation. The Truckee Meadows feature of the improvements greatly reduces the frequency and duration of flooding in a large agricultural area in Truckee Meadows, and improves drainage and sanitary conditions in the outskirts of Reno and Sparks. The Lake Tahoe feature of the improvements permits relatively rapid releases from the lake during floods, thus alleviating damages to lakeshore properties from high lake levels. Since its construction, the project has prevented about \$2,800,000 in flood damages.

Local interests are responsible for operation and maintenance of the project.



Truckee River channel in downtown Reno

Flood Plain Management Services

Flood plain management services by the Corps are discussed in detail in Chapter 1, titled "U.S. Army Corps of Engineers and Its Activities in Nevada"; and pertinent information on flood plain information studies is given in the following paragraph.

Flood Plain Information Reports (Sacramento District)

Three flood plain information reports have been completed for streams in the Truckee River Basin as follows: (1) a report for the Truckee River in the Reno, Sparks, and Truckee Meadows areas; (2) a report for Steamboat Creek and tributaries in Steamboat and Pleasant Valleys; and (3) a report for the foothill streams southwest of Reno.

Emergency Operations

Authority for the Corps of Engineers to perform emergency work is described in detail in Chapter 1, titled "U.S. Army Corps of Engineers and Its Activities in Nevada."

Work Under Public Law 84-99 and Public Law 83-780 (Sacramento District)

The Corps has performed emergency floodfighting, rescue, and repair work under Public Law 84-99, and antecedent legislation, and emergency snagging and clearing work under Section 208, the 1954 Flood Control Act (Public Law 83-780), as amended by Section 26 of the 1974 Water Resources Development Act (Public Law 93-251) and Section 915 of the Water Resources Development Act of 1986 (Public Law 99-662), in the Central Lahontan Area. This work is summarized in the following table:

Location	Type of work	Costs up to Sept. 30, 1986
Reno	200,000 Sandbags	63,000
Truckee River	Debris removal and channel restoration.....	\$149,000
Dog Creek	Debris removal	21,000
Steamboat and Galena Creeks	do	3,000
	Levee repair	6,000
Carson River	do	66,000
	Snagging and clearing	29,000
	Debris removal and channel restoration.....	296,000
Walker River	do	<u>22,000</u>
Total		\$655,000

Work Under Public Law 93-288 and Prior Disaster Relief Acts (Sacramento District)

The Corps of Engineers has performed emergency rehabilitation work under Public Law 93-288 and prior disaster relief acts. The Corps' work in the Central Lahontan Area is summarized in the following table:

Stream	Type of work	Costs up to Sept. 30, 1986
Truckee River	Debris removal and channel restoration.....	\$90,000
Dog Creek	Channel restoration	700
Steamboat and Galena Creeks.	do	1,900
Carson River.	Snagging and clearing and channel restoration	268,000
Carson River.	do	<u>10,700</u>
Total		\$371,300

Survey Investigation

Truckee Meadows (Reno-Sparks Metropolitan Area) (Sacramento District)

The Truckee Meadows (Reno-Sparks Metropolitan Area), Nevada, investigation was authorized in 1964 by a Senate Public Works Committee resolution to determine the feasibility of providing additional flood protection for the Truckee Meadows area at and below Reno.



Flooding of Truckee River at Lake Street Bridge in Reno, Nevada, in December 1981

Many damaging floods have occurred in Reno, Sparks, and the Truckee Meadows from winter rains, snowmelt, and summer cloudbursts. Rain floods resulting from prolonged heavy rainfall can occur in the area anytime from November to April. Flooding is more severe when previous rainfall has caused the ground to be saturated, when the warm rain on snow in the Sierra adds snowmelt to rain flood runoff.



Looking northwest at flooding in Sparks, Nevada, industrial area in February 1986



Truckee River and meadows in industrial area of Reno

The largest flood of record occurred on December 23, 1955, when an estimated peak flow of 20,800 cubic feet per second was measured at Reno. The 1955 flood caused damages estimated at \$1,680,000 in downtown Reno and in the Truckee Meadows. Another large flood in February 1963 had an estimated peak flow of 18,400 cubic feet per second and caused damages estimated at \$1,680,000. If the 1963 flood were repeated today, damages would exceed \$139,000,000. The most recent flooding occurred in February 1986 and caused an estimated \$20 million in damages.

Studies completed to date recommend a plan that would provide 100-year flood protection to the Reno-Sparks area and additional recreational facilities. The flood control features include approximately 5 miles of floodwalls, 7 miles of levees, and the replacement of six bridges along the Truckee River. Some channel excavation would be required and a 900-acre detention basin and levees would be constructed to mitigate potential increases in downstream flooding due to upstream flood control measures. Mitigation of adverse effects of the flood control features on fish and wildlife resources would be accomplished through planting of riparian vegetation on 31 acres along the Truckee River and Steamboat Slough.

Recreational facilities include multipurpose day-use facilities, bicycle paths, pedestrian paths, river overlooks, picnic sites, and a marsh nature area.

The total estimated (1986) first cost of the project is \$78,400,000, of which \$39,200,000 is Federal cost and \$39,200,000 is non-Federal cost. Project benefits include \$73,660,000 for flood control \$4,740,000 for recreation. The B/C ratio is 1.8 to 1.0.

The Final Feasibility Report and EIS was approved by BERH on June 26, 1985. The Chief of Engineers report was issued on July 25, 1986.

regulations for the use of space allocated to flood control or navigation at all reservoirs constructed wholly or in part with Federal funds, the Corps of Engineers — in cooperation with the U.S. Bureau of Reclamation — has developed rules and regulations for operating flood control storage in three U.S. Bureau of Reclamation reservoirs in the Truckee River Basin. The reservoirs, which are in California, operate in conjunction with Lake Tahoe, Martis Creek Lake, and existing channel improvements to provide protection against floods primarily to Reno. The projects are Boca Reservoir, an element of the Truckee Storage Project, and Prosser Creek and Stampede Reservoirs, elements of the Washoe Project. The reservoirs are in the Sacramento District.

In addition to regulating streamflows for flood control, the reservoirs provide water for agricultural, municipal, and industrial uses; for improvement of the fishery in the Truckee River and Pyramid Lake; and for water-oriented recreational activities.

Boca Reservoir, which is on the Little Truckee River, was completed in 1939. The capacity of the reservoir is 41,200 acre-feet. The Stampede Reservoir, which is also on the Little Truckee River, was completed in 1970. The reservoir capacity is 226,500 acre-feet. The combined flood control storage in the two reservoirs is 30,000 acre-feet.

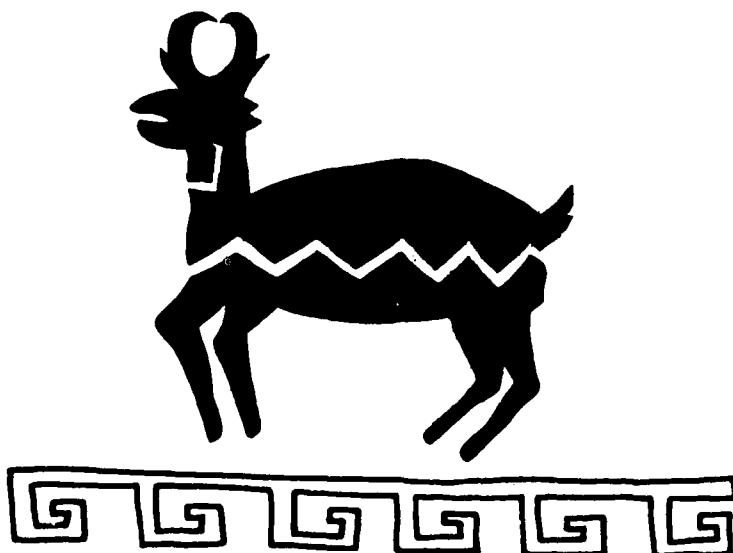
Prosser Creek Reservoir, which is on Prosser Creek, was completed in 1962. The capacity of Prosser Creek Reservoir is 30,000 acre-feet including 20,000 acre-feet for flood control storage.

Available hydrologic and hydraulic data for parts of the Truckee, Carson, and Walker Rivers have been supplied to the Federal Insurance Administration for use in its rate studies.

In July 1986, the Sacramento District initiated a Flood Insurance Study for portions of the unincorporated areas of Douglas County. The study is being conducted for the Federal Emergency Management Agency and is scheduled for completion in July 1988.

Cooperation with Other Agencies in Their Projects

In carrying out the responsibilities assigned by the 1944 Flood Control Act, as amended, of formulating rules and

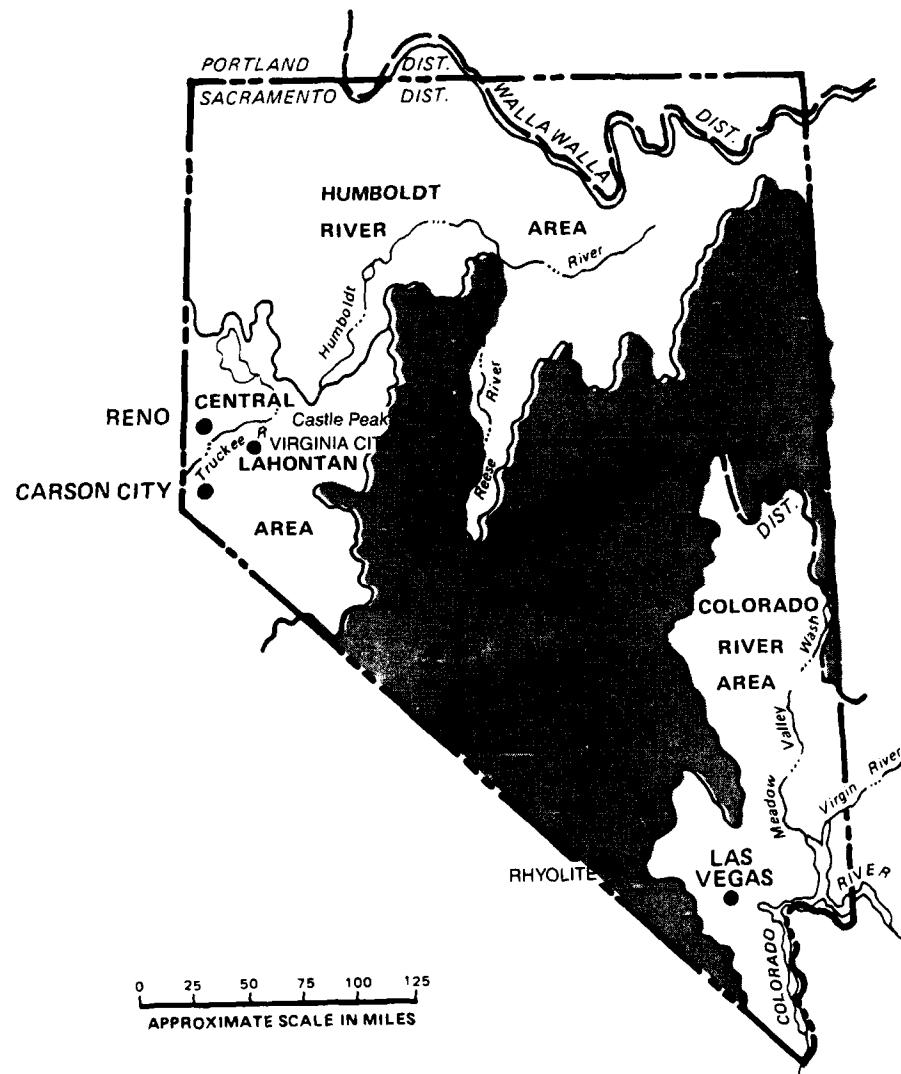




Flood damage of east fork of Carson River in Gardnerville in February 1986

Chapter 4





Tonopah Area

The Tonopah Area, comprised of about 44,300 square miles of numerous broad valleys; high, dry mountain ranges; and closed basins in southern, central, and northeastern Nevada, is vast and largely uninhabited. All streams terminate in sinks or dry lakebeds, and there are no major stream systems. The mountain ranges generally are parallel and trend north to northeast, with crests typically about 3,000 to 5,000 feet above the adjacent valley floors. Substantial segments of the crest in the central and eastern areas are more than 10,000 feet above mean sea level. The highest peaks in Nevada — Boundary Peak (13,145 feet near the California border in Esmeralda County) and Wheeler Peak (13,063 feet, southeast of Ely, in White Pine County) — are in the Tonopah Area. Valley-floor areas range from about 2,100 feet above mean sea level in the extreme southern part to about 7,000 feet in the central part. Outward from these high valls is a general regional gradient marked by progressively lower valley-floor elevations.

The climate is arid to semi-arid with extremes in temperature and precipitation. Climatic conditions generally vary with latitude and elevation. With the exception of the mountainous areas, winters are short and mild and summers are long and hot. Most annual precipitation occurs during the winter months in the form of rain or snow. With the exception of localized cloudburst storms, summers are nearly rainless. The average annual precipitation is 9.6 inches with a maximum of 45 inches in the higher elevations and a minimum of 3 inches in some of the desert areas. Temperatures range from summer highs of more than 100°F in desert areas to winter lows of minus 15°F in the higher mountains. However, in any given locality, climatic conditions depend on local conditions and exposure to moisture-bearing winds.

One of the most sparsely populated areas in the continental United States, Tonopah Area's present population of about 20,000 is expected to increase to about 24,000 by 2000. The principal centers of population are Tonopah with a population of about 3,600 and Ely with a population of 5,100.

The economy of the area is based primarily on agriculture and mining. Most agricultural activity is associated with the livestock industry, which involves widely dispersed operations: Animals are grazed in the mountains in summer and in the foothills and deserts in the spring and fall. In winter, they are fed hay and forage at the base ranch. Except cotton, which is grown in the extreme southern part of the area, most irrigated crops are used to support livestock-raising operations. The economy of the area has suffered since an open-pit copper mine near Ely closed in 1982. Tourism and the recreationist-vacationist industry are becoming increasingly significant segments of the economy, especially since Congress established a new national park in October 1986 near Baker. This 76,000-acre Great Basin National Park, created from Lehman Caves National Monument and parts of the Humboldt National Forest, is centered on 13,063-foot Wheeler Peak and includes glistening alpine lakes, lush meadows, deep caves and gnarled and grotesque groves of bristlecone pine, the oldest living trees on Earth. It also has working cattle and sheep ranches.

Along with the national park, the Tonopah Area offers an abundance of outdoor recreational activities, such as camping,

picnicking, hunting, fishing, and hiking, as well as opportunities for unusual or specialized activities, such as rock-hounding, bottle collecting, artifact hunting, mountain climbing, sandskiing, and exploring historic mining towns. Today Tonopah Area is served by U.S. Highways Nos. 6, 50, 93, and 95 and by a number of State highways.

Flooding in the area is caused principally by rapidly melting snow in the late spring and by cloudburst storms during summer and fall. Flooding from general rain is possible, but rarely occurs. Because of the sparse population and limited development flood damage has not been extensive in the past. However, flood-damage-reduction programs should be undertaken in areas where flood damage occurs. Additional water supply or irrigation, municipal, and industrial (mineral production) uses are needed. Generally, groundwater is available for development to meet projected needs.

However, for some uses, the cost of developing groundwater may be relatively high because of the treatment required for quality. Development of the recreational potential of the Tonopah Area requires provision of water surface areas for boating, swimming, and other water-oriented activities.

Flood Control Project

Gleason Creek Dam (Sacramento District)

Gleason Creek Dam would be a flood control dam on Gleason Creek about 7 miles upstream from Ely, in White Pine County. The drainage area upstream from the dam comprises 55 square miles. The dam, which would be an earthfill structure with a maximum height of 52 feet and a crest length of 538 feet, would form a reservoir with a gross capacity of 1,500 acre-feet including 200 acre-feet for inactive storage. Authorization of the project provided that local interests would be required to maintain and operate the project after its completion, and to preserve the channel of Gleason Creek through Ely to the flow capacity existing in 1958.

This project was authorized by the Flood Control Act of 1960 but was deauthorized by the Water Resources Development Act of 1986.

Emergency Operations

Emergency floodfighting and repair and restoration work under Continuing Authorities available to the Corps of Engineers has totaled about \$25,000 for floodfighting and snagging and channel-clearing work along Gleason Creek in the vicinity of Ely. The work was done by the Sacramento District.



Castle Peak, north of Virginia City, typifies rugged high desert terrain of Tonopah Area. (Photo by Gary W. Gaynor, U.S. Army Corps of Engineers)



Rhyolite, a desert ghost town in Nye County, preserves Tonopah Area's rich historical past.

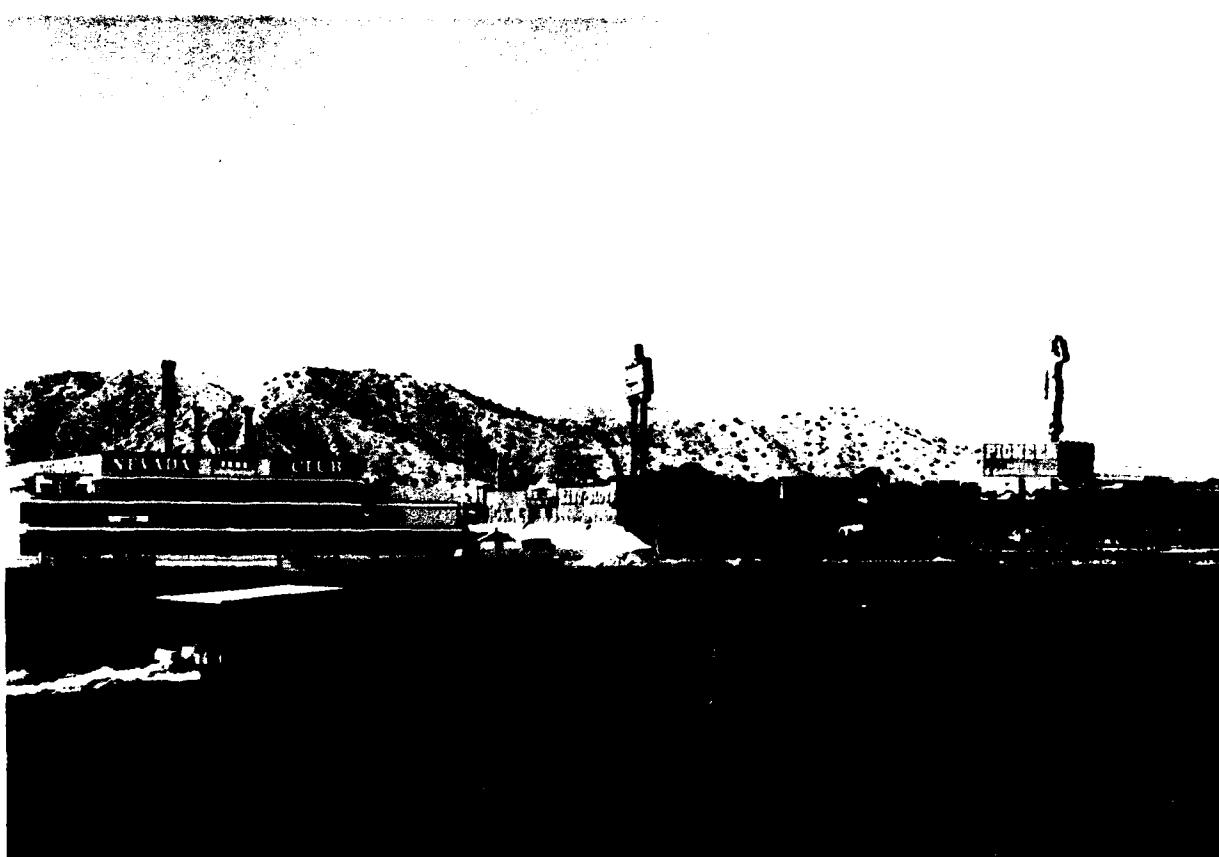


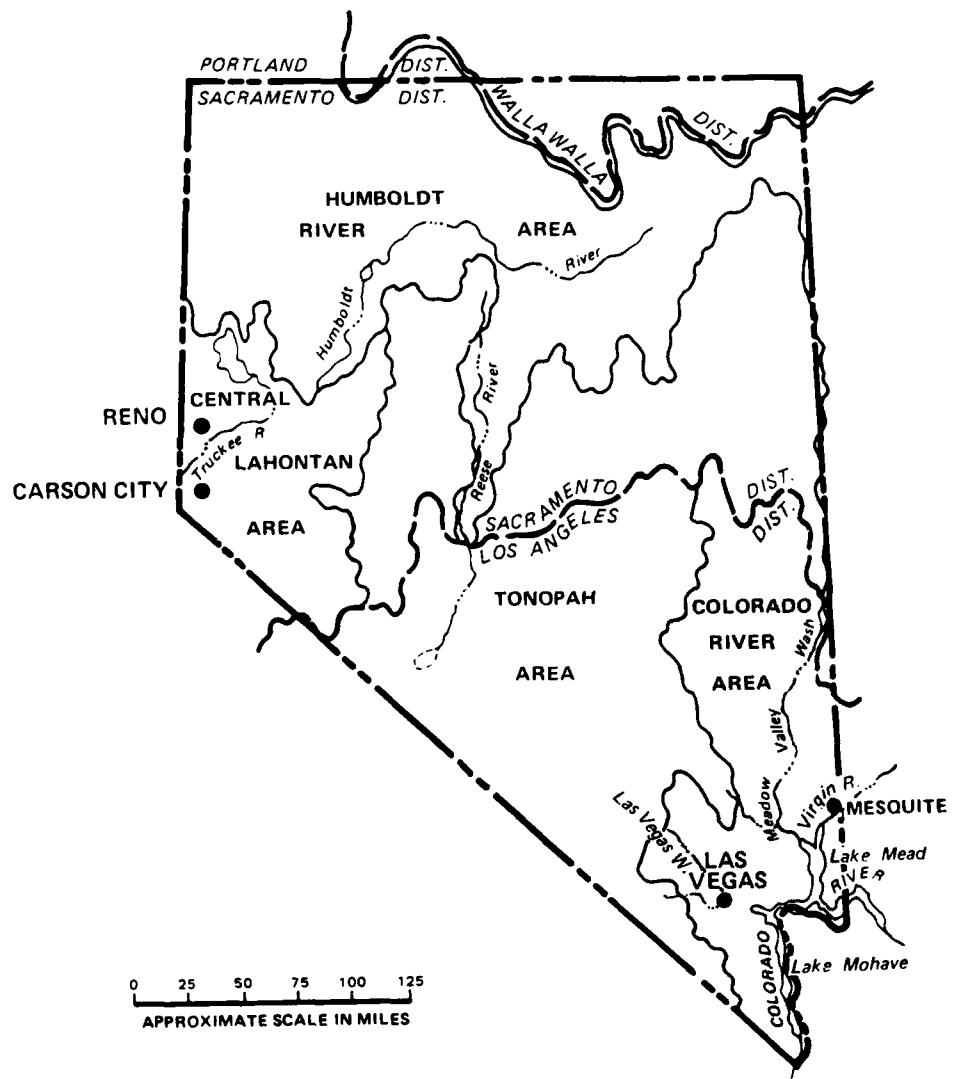
Red Rock Canyon in Nye and Clark Counties is a popular year-round recreational area



Wheeler Peak

Chapter 5





Colorado River Area

The Nevada part of the Colorado River Area comprises 17,310 square miles of high desert lands, plateaus, and mountains in the southeastern part of the State. Major streams include the Colorado River, the Virgin River, the Muddy River, and Las Vegas Wash. The flow in the Colorado River is controlled by Lake Mead and by Lake Powell, which is just upstream from the Colorado River Area boundary.

Wide variations occur in the climate — mostly as a result of large differences in elevation, a considerable range in latitude, and the distribution of mountain ranges and highlands. The climate is typical of Southwest desert areas: In general, the summers are long and hot, and the winters are short and relatively mild; the humidity is low, and the rate of evaporation is high. Recorded extremes of temperature range from about 120°F. at Logandale to about minus 30°F. at Caliente; the long-term average temperature at Las Vegas is about 65°F. Tourists from all parts of the world are attracted by both the hot deserts and the cold highlands and the recreational opportunities that abound. Lavish year-round entertainment is available in Las Vegas hotels and casinos; and camping, golfing, boating, hunting, and fishing are year-round outdoor recreational activities in many other parts in the Colorado River Area.

Although Colorado River Area contains some of the most arid parts of United States, the area has been constantly plagued by damaging floods. Major flooding is caused by general winter storms with low-intensity rainfall over wide areas, often continuing for several days; by general summer storms with heavy rainfall over wide areas; and by local thunderstorms with high-intensity rainfall, usually of short duration, over small areas. Thunderstorms, which produce many of the destructive flash floods that are well known in the Southwest, can occur at any time of the year, but are most common during the late summer and fall. An average of 26-28 thunderstorm days a year for a 30-year period has been recorded for the Las Vegas area. Streamflow is extremely variable both in time and location; the Colorado River and the Virgin River are the only perennial streams in the area except for short reaches of streams where base flow is provided by springs.

Major flood problems exist at unprotected towns and in developed agricultural areas, and the continued development each year of flood plain land for agricultural and urban use greatly increases the flood damage potential. Damaging floods in the Nevada part include the March 1938 flood, with a peak discharge of 15,000 cubic feet per second, on Meadow Valley Wash; the July 1975 flood, with a peak discharge of 12,010 cubic feet per second, on Las Vegas Wash at North Las Vegas; and the December 1966 flood, with a peak discharge of 32,500 cubic feet per second, on the Virgin River.

Although the Corps of Engineers has completed some work in the Nevada part of the Colorado River Area, much remains to be done if lives and property are to be protected against the threat of recurring floods. With the increases in population and resultant changes in land use that are expected to occur in the future, existing flood problems will magnify and new problems will develop. The population of

the Nevada part of the Area totaled 580,000 in 1986. The population is expected to increase to about 886,000 by 2000, and to about 1,075,000 by 2020.

The existing Mathews Canyon and Pine Canyon Dams, constructed by the Corps, have alleviated some of the flood problems. However, additional detention structures are required to control floodflows, and levee and channel improvements are required to increase the flood-carrying capacities of many streams. Without comprehensive planning for flood damage prevention including construction of additional flood control improvements and the implementation of flood plain management measures, the average annual flood damages are expected to increase from about \$13,300,000 in 1986 to \$23,000,000 by 2000, and to \$50,000,000 by 2020.

Pertinent information on the work of the Corps in the Nevada part of the Colorado River Area is given in the following paragraphs.

Flood Control Projects

Mathews Canyon and Pine Canyon Dams (Los Angeles District)

Mathews Canyon and Pine Canyon Dams, which were completed by the Corps of Engineers in 1957, are in Lincoln County about 100 miles north of Hoover Dam and about 20 and 17 miles, respectively, east of the City of Caliente. The dams are interdependent units of a project for the protection of lands and improvements against floods along Clover Creek, Meadow Valley Wash, and the lower Muddy River — in the Virgin River Basin. The project was constructed at a Federal first cost of \$1,400,000.

Mathews Canyon Dam is in Mathews Canyon — a tributary of Clover Creek, which is a tributary of Meadow Valley Wash. Pine Canyon Dam is in Pine Canyon, which also is a tributary of Clover Creek.

Mathews Canyon Dam is an earthfill structure with a height of 71 feet and a crest length of 800 feet. The dam forms a reservoir with a gross capacity of 6,300 acre-feet including 1,000 acre-feet for sedimentation. The drainage area upstream from the dam comprises 34 square miles.

Pine Canyon Dam is an earthfill structure with a height of 92 feet and a crest length of 884 feet. The dam forms a reservoir with a gross capacity of 7,700 acre-feet including 14,000 acre-feet for sedimentation. The drainage area upstream from the dam comprises 45 square miles.

If a major flood (project design flood) were to occur, the project would prevent damages estimated at \$12,649,000 (1986) to residential, business, public, and agricultural properties; to irrigation and drainage works; to existing flood control improvements; and to highways, roads, railroads, and utilities. The total average annual benefits from flood damages prevented by the project are estimated at \$660,000 (1986).

The project is maintained and operated by the Corps of Engineers.



Aerial view of Mathews Canyon Dam



Closeup of spillway at Mathews Canyon Dam



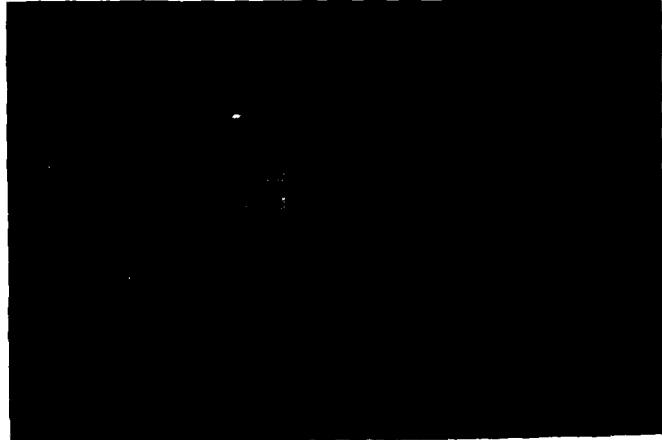
Pine Canyon Dam viewed from reservoir area



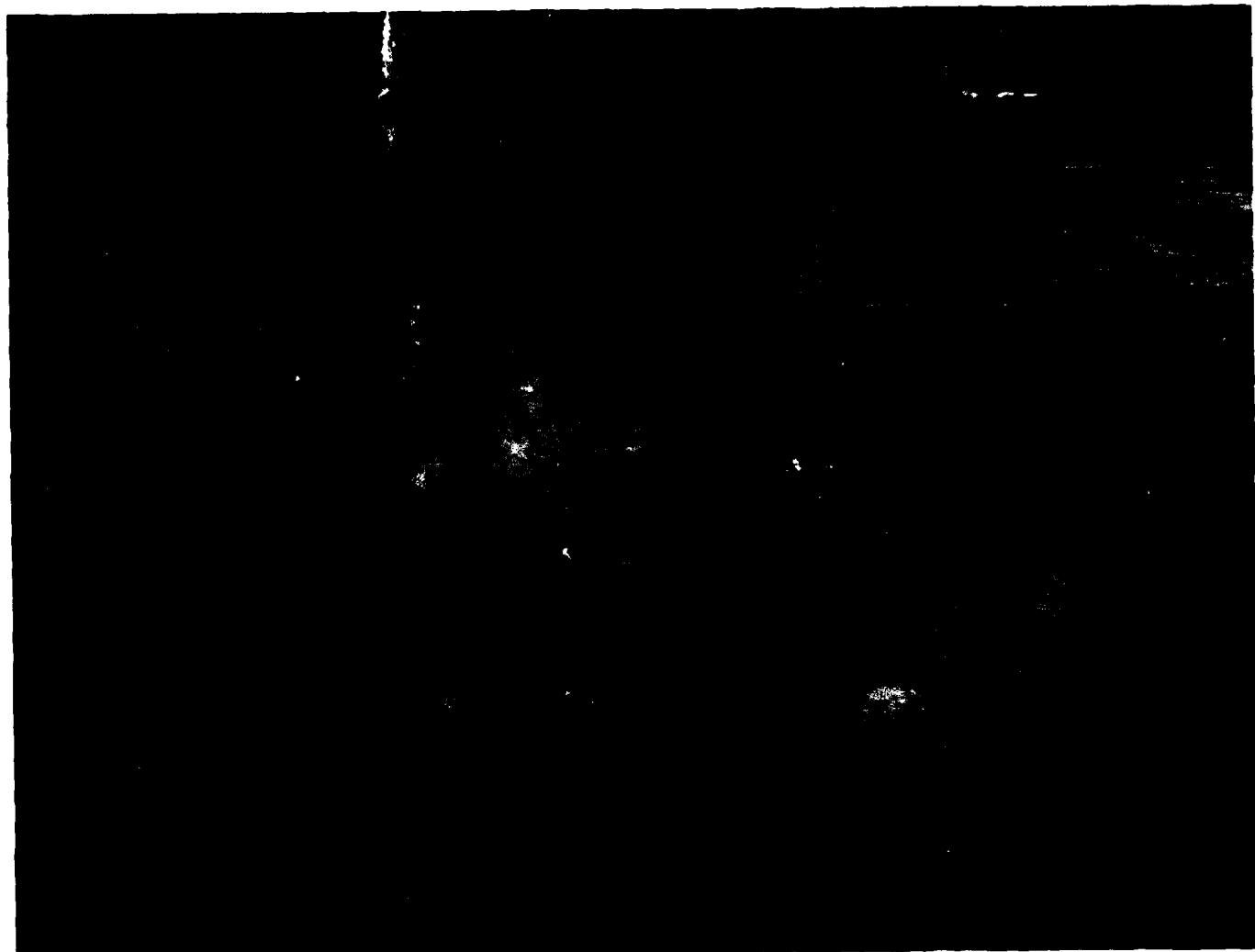
Borrow-pit lake formed by stormwaters just upstream from Pine Canyon Dam



Firepits and ramadas for recreationists at Pine Canyon and Mathews Canyon Dams



Typical restroom facilities at Pine Canyon and Mathews Canyon Dams



Inspecting intake structure at Pine Canyon Dam during periodic maintenance operations

Flood Plain Management Services

Flood Plain Information Reports (Los Angeles District)

Two flood plain information reports have been completed: one in 1967 for lower Las Vegas Wash, and the other in 1974 for the Muddy River in the vicinity of Overton.

Emergency Operations

Authority for the Corps of Engineers to perform emergency work is described in detail in Chapter 1 titled "The U.S. Army Corps of Engineers and Its Activities in Nevada."

Work Under Public Law 84-99 (Los Angeles District)

1949 Flood on Clover Creek and Meadow Valley Wash at Caliente

Floods began January 31, 1949, on Clover Creek and Meadow Valley Wash, after heavy rains and snowmelt, threatening to inundate the City of Caliente. The Corps of Engineers performed floodfighting work including sandbagging to protect the endangered city. The Corps also built revetments and cleared and straightened the stream channels. The work was done at a cost of \$8,100.

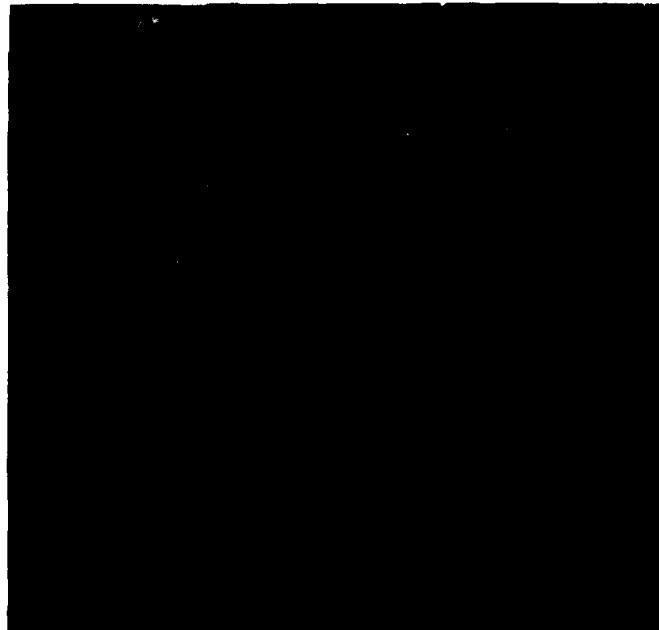
1969 Operation Foresight on Virgin River at Mesquite

Near-record snowmelt flooding was expected early in 1969 in many areas of the Southwest. The President urged aggressive use of the Continuing Authorities of the Corps of Engineers under Public Law 84-99 to develop a program of flood prevention. As a result, Operation Foresight — named by Office of Emergency Preparedness — was undertaken by the Corps at various locations including those along the Virgin River near the town of Mesquite, where severe silting of the riverbed had caused the diversion of river flows to a secondary channel. The diverted flows had eroded channel banks and threatened irrigation works and local streets. Local people tried unsuccessfully to stem the erosion by placing car bodies along the stream banks.

Aware that additional damage would occur with the expected snowmelt flooding, the Corps performed emergency work to prevent further damage. The work included construction of a temporary levee across the secondary channel, facing the upstream side of the levee with anchored car bodies, and excavating a pilot channel to reopen the main channel. The emergency work, which was done at a cost of about \$11,000, prevented further erosion when the snowmelt flows occurred. The damage prevented by the work under Operation Foresight totaled about \$15,000.

1972 Flood on Virgin River at Mesquite

In November 1972, the Clark County Civil Defense Agency

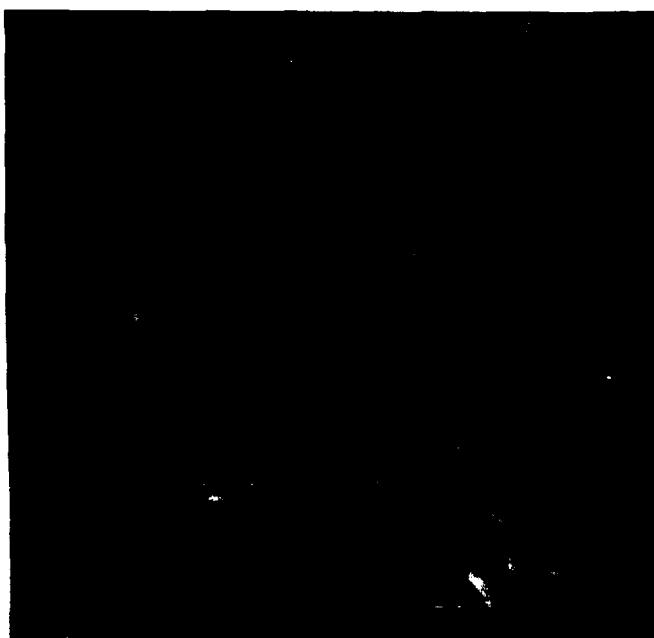


Petroglyphs, now protected from floodwaters upstream

called upon the Corps of Engineers for help when above-normal flows on the Virgin River eroded the river bank at Mesquite. The erosion threatened to cause the spillage of sewage from nearby lagoons into the river and thence into Lake Mead, the central source of drinking water for Las Vegas. Emergency work by the Corps consisted of rebuilding and revetting the banks adjacent to the sewage lagoons. The work was done at a cost of about \$8,000.

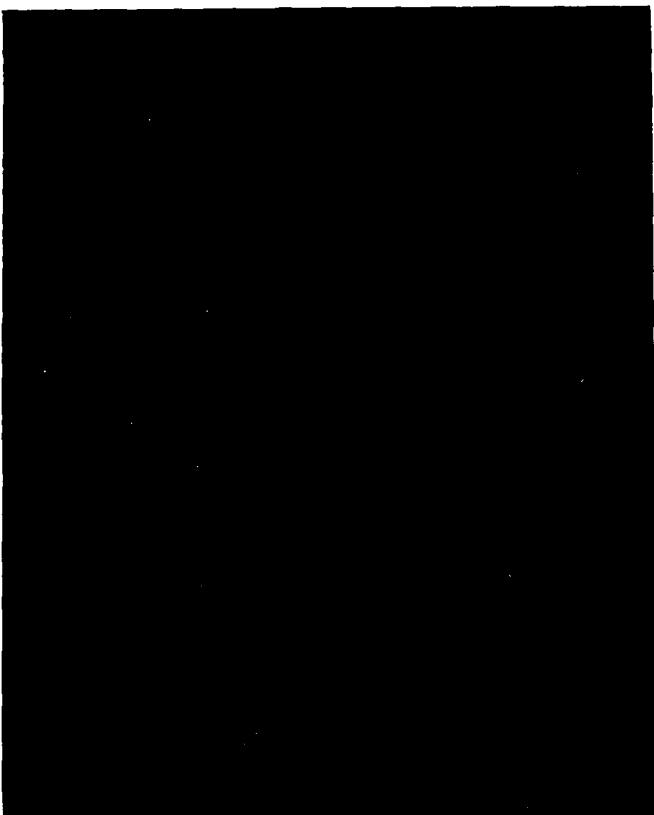
1981 Post-Flood Data Collection on Moapa Valley

A storm event on August 10 caused flooding in the Moapa Valley and Overton, Clark County. Due to the sudden nature of the storm, the Corps was restricted to perfor-



Another view of petroglyphs

ming only post-flood data collection. This was done at a cost of \$2,500.



Stone steps being placed along staff gauges on embankment of Pine Canyon Dam

1983 Field Investigation for Southern California Storm Damages

Tracking Southern California storms led the Corps to perform field investigations for flooding in Nevada during January storm events. No further assistance was required from the Corps. The associated investigation cost, however, was approximately \$3,073.

1983 Floodfight on Colorado River

Releases from Federal reservoirs caused controlled flooding in the month of June along the Colorado River below Hoover, Davis, and Parker Dams. Areas in Laughlin were plagued with erosion of the river banks. Various buildings and a construction site were in danger of being undermined by the heavy flows. The Corps provided technical assistance to Clark County officials in the construction of a groin to alleviate bank erosion in Laughlin. Cost of assistance was approximately \$24,232.

1983 Floodfight at Wells Siding

On July 27 the Director of Public Works for Las Vegas, Nevada, requested the Corps to provide assistance for emergency floodfight work at the Wells Siding Muddy River Dike in Moapa Valley. On July 22, Las Vegas and Moapa Valley received flash flooding from heavy thunderstorms. Thunderstorm activity continued throughout the week with



Snowmelt water moves under a bridge above the foothills of the Sierra Nevada in California

another peak occurrence on July 27 and 28. On July 28, the Corps supplemented the county's efforts of dumping fill at dike erosion areas by placing rock riprap to protect weak spots. Approximately 1,000 cubic yards of rock were placed at an estimated cost of \$35,000, which included field investigations.

Work Under Public Law 93-288 (Los Angeles District)

1975 Clark County, FDAA Assistance

The Corps of Engineers provided "FAST" team assistance to the Federal Disaster Assistance Administration to develop preliminary damage assessments for flash flooding which occurred on July 3 in the Las Vegas area.

1981 FEMA Assistance, Moapa Valley

A storm event on August 10 caused flooding in the Moapa Valley and Overton, Clark County. The Federal Emergency Management Agency (FEMA), Region 9, requested that the Corps perform an assessment of damages to public facilities in the flood-stricken areas.

1984 Clark County, Presidential Disaster Declaration, September 6, 1984

Thunderstorm events, which occurred in Moapa Valley, Clark County, from July 22 to August 27, resulted in the county receiving a Presidential Disaster Declaration. The Corps provided FEMA assistance with damage assessments, initial inspections, interim inspections, final inspections, and technical assistance at a cost of \$40,000.



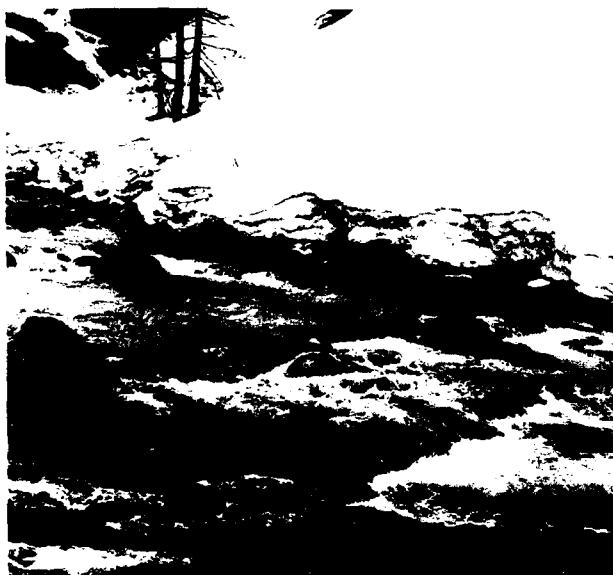
Hoover Dam

Feasibility Investigation

Las Vegas Wash and Tributaries (Los Angeles District)

The Las Vegas Wash and Tributaries investigation was authorized in October 1982 by a resolution adopted by the Senate Committee on the Environment and Public Works to determine the feasibility of providing flood protection to the Las Vegas Valley. Communities in the study area include Las Vegas, North Las Vegas, Henderson, and unincorporated parts of Clark County, Nevada.

In 1959, the Corps' recommendation for flood control works on Las Vegas Wash was never implemented because of lack of local support and subsequently deauthorized in 1977. Since then, the population has grown from 94,000 in 1959 to over 540,000 in 1986. As urban growth continues in this area so does the flood severity increase, causing flood control problems on numerous creeks in the area and making flood control more critical.



Sparkling snowmelt water in an ever-widening front pushes its way to the sea from the record-smashing snowfall in California in 1969.

Many damaging floods caused by high-intensity, short-duration summer thunderstorms occurring mainly from mid-June to mid-September, the "monsoon" season, have taken place. The July 1975 flood caused \$5,000,000 in damages, \$9,600,000 at current prices. Two floods occurred in the Las Vegas area in August 1983 and caused extensive damages, estimated at \$1,000,000. The severity of the July and August 1984 flooding and associated damages, estimated at \$6,000,000, resulted in a Presidential disaster declaration for Clark County, including the Las Vegas Valley, in September 1984.

The feasibility investigation is following a two-phase planning process. The first phase, the reconnaissance phase, which was initiated in October 1983 and completed in July

1985, indicated a Federal interest in solving the flood problem. The second phase, the feasibility phase, was initiated in September 1985, and 50-percent cost-sharing was implemented on March 15, 1986, with the local sponsor, the Clark County Regional Flood Control District (CCRFCD).

The study will examine the flood control facilities recommended by the CCRFCD Flood Control Master Plan on the following watercourses:

Las Vegas Wash
Las Vegas Creek
Tropicana Wash
Pittman Wash

Las Vegas Range Wash
Flamingo Wash
Duck Creek
Henderson area

The Study is scheduled for completion in March 1990. The Water Resources Development Act of 1986 (Public Law 99-662, Section 401C), authorized \$2,000,000 for planning, engineering, and design of a comprehensive project for flood control in the Las Vegas Valley and Tributaries area, Nevada.

Cooperation with Other Agencies in Their Projects

Flood Control Storage at Hoover Dam (Los Angeles District)

In carrying out the responsibilities assigned to the Corps of Engineers by the 1944 Flood Control Act, as amended, for formulating rules and regulations for use of space allocated to flood control or navigation at reservoirs constructed wholly or in part with Federal funds, the Corps — in cooperation with the U.S. Bureau of Reclamation — has developed rules and regulations for operating flood control storage in Lake Mead (Hoover Dam). The Corps has revised the original rules and regulations — taking into consideration effective storage space in upstream reservoirs constructed since the original rules and regulations were issued for Hoover Dam.



Lake Mead (Hoover Dam) provides recreation and needed flood-control storage

Las Vegas Wash



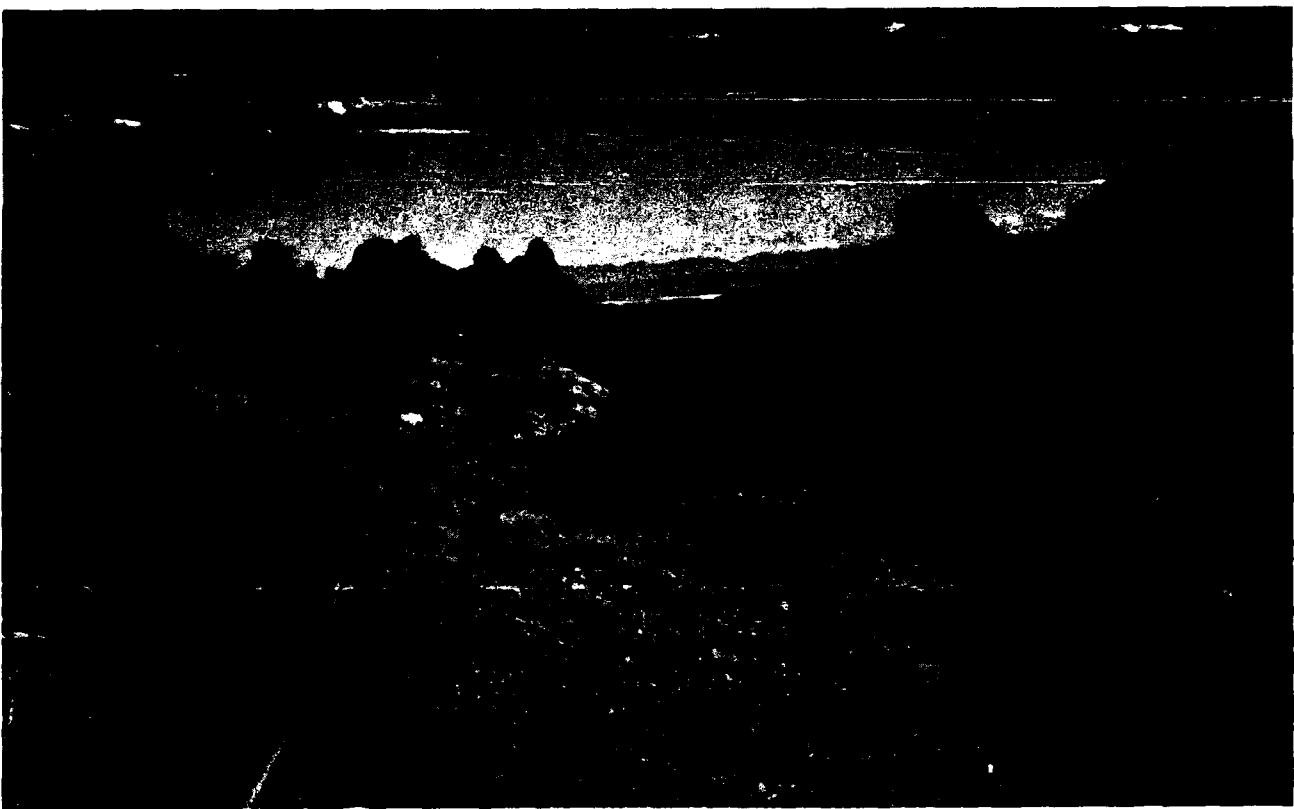
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Las Vegas Ranch Wash

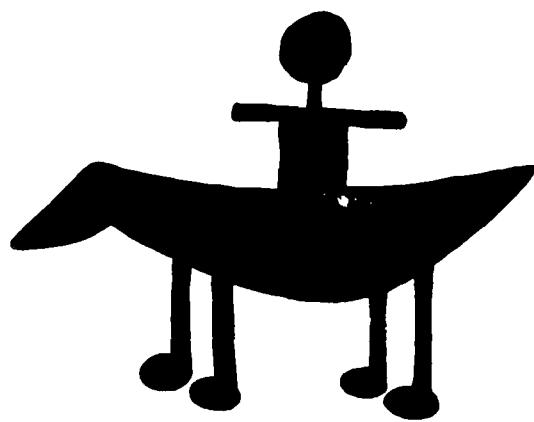


Flamingo Wash

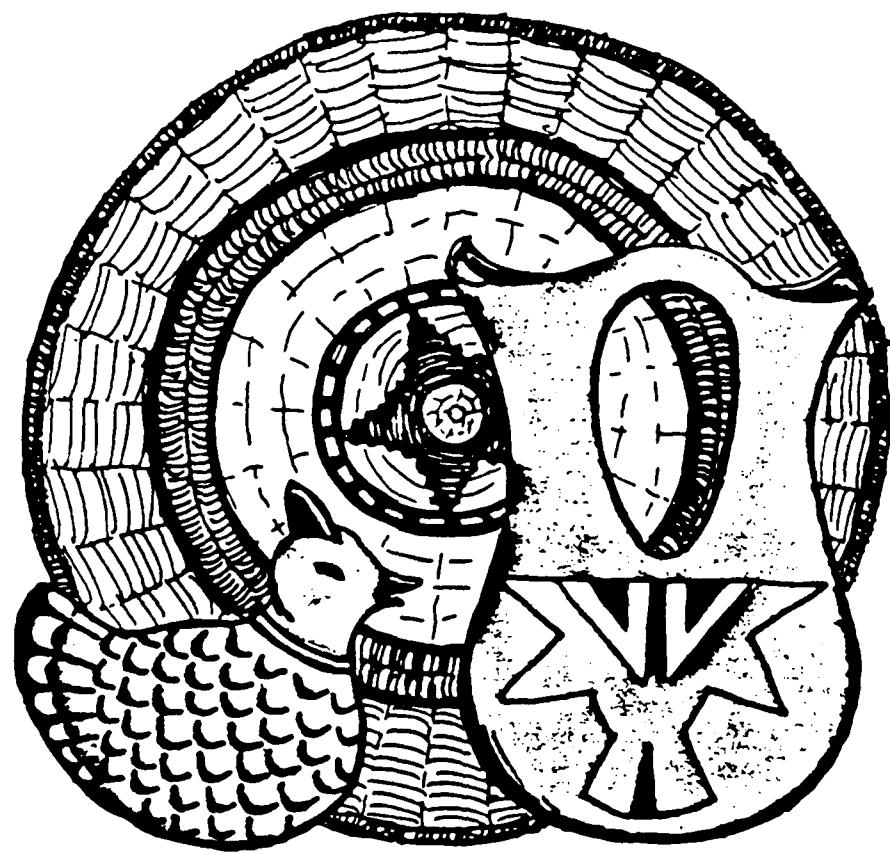




"High Desert," Castle Peaks



Lake Mead attracts thousands of boating and fishing enthusiasts



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